This magazine is published to promote sound thought upon and concerning industrial medicine and traumatic surgery. To that end it will contain articles, news items, reports, digests and other presentations, together with editors' comments. The editorial policy is to encourage frank discussion. On this basis contributions are invited.

Industrial Medicine

Reg. U. S. Pat. Off.

The editors will exercise care in checking on the accuracy of data printed, but in all other respects articles and opinions of which expression is allowed are the opinions of their authors—the editors reserving in all cases the right to comment on the same, in the current or any subsequent issues, as they may be inclined.

The Journal of Occupational Diseases and Traumatic Surgery

The Science, the Law and the Economics of Industrial Health

Volume 7 JANUARY, 1938 Number 1

Syphilis and the Worker

R. R. SAYERS, M.D.,
Senior Surgeon, Division of Industrial Hygiene, National Institute of Health, Washington, D. C.

DURING recent months there has been a rising trend of interest in syphilis as a problem of industry.* The hazards of this disease, hazards of infection in the early stages, hazards of mental or physical failure in the later stages, have long been understood by industrial surgeons. The interest of railways in the problem dates back nearly a decade and a half. But until the lifting of the taboo which surrounded syphilis there were obstacles in the way of effective action.

Industry and its economic problems had not a little to do with driving syphilis into the open. With the Social Security Act, America had a new stake in keeping well. The soundness of any program of insurance, whether public or private, will depend in the end upon the elimination of unnecessary drains upon the insurance funds. The venereal diseases are among the most definitely preventable of all the serious diseases which leave their mark upon the ledgers of the disability and the unemployment rolls. It is not difficult to understand why we have industrial medical services among our strongest allies.

Surgeon General Parran has discussed the broad economics of this problem in an article entitled *"Syphilis is Bad Business"* in the August issue of *Dun's Review*. In it he traces the economic inroads of syphilis.

Syphilis, he finds, is one of our greatest killers. With 850,000 years of life expectancy lost to our 40,000 annual deaths from cardiovascular syphilis, with another 100,000 life-years lost to the 5,600 deaths from tabes and paresis, with uncounted thousands of life-years lost to congenital syphilis, the total loss of years of life expectancy is well past the million mark. More than a sixth of the life expectancy of a white male in the 30- to 50-year age group is lost if he has syphilis. These figures are based upon a study by Usilton from the records of the Cooperative Clinical Group and data obtained in surveys of syphilitics of urban and rural communities including 20% of the population. Yet insurance examinations ordinarily do not include a blood test.

There is also the cost of caring for these disabled by central or nervous system disorders and blindness due to syphilis. The institutional costs of these total more than $41,000,000. One hundred and ten million dollars is set down as a most conservative figure for dealing, by present methods, with America's 1,100,000 annual cases of syphilis.

Dr. Parran then goes on to discuss other losses which come even closer home to the industrial medical officer—the operating losses—the hazards which sap the efficiency and reduce the safety of the plant. No one would care to guess at what the total cost might be for all the useless infection of worker by worker, the time lost and unnecessary compensation secured by latent syphilitics, the errors of paretics which in more fortunate instances injure only the product and in more serious cases threaten the safety of fellow workers or patrons, or the major calamities which occur when syphilitic delusions mark executive judgments.

In the Surgeon General's address before the medical and surgical section of the American Railway Association in June, and in an article he published in the current September issue of *Factory*, a management magazine, he outlines a general policy for industry in its approach to syphilis. That policy in summary suggested:

1. That routine blood tests are desirable for applicants for employment.
2. That routine blood tests are desirable at the time of periodic re-examination of employees.
3. That industry with its compact organization will find the development of a vigorous educational program profitable.
4. That industry might extend that educational campaign into the field of prophylaxis.
5. That there is a responsibility upon the industrial medical officer to see that adequate modern treatment is available to employees at prices ordinary wage-earners can afford—that if such is not otherwise available, the industrial medical service should itself undertake such treatment.

* Presented before the American Association of Railway Surgeons, Chicago, Illinois, September 22, 1937.

6. That syphilis must at all times be handled as merely another communicable disease. The privacy of relations between the worker and the medical service should be conducted in the best professional tradition. In ordinary cases it cannot be regarded as ground for the rejection of applicants or for the dismissal of employees, though treatment may be properly required.

These statements form a backdrop for the discussion of syphilis and the worker. They show the interest of industry in the problem of syphilis. They set forth a well-articulated, civilized policy for the management approach to the problem. I would like to carry the discussion a step forward and consider the administrative judgments which round out a program for the control of syphilis in industry.

ONE need not search far to conclude that the policies now applied are often hit or miss. I have in mind the policy followed until a short time ago by the Civil Service Commission of the United States. It did not ask routine blood tests for syphilis from prospective employees. When, however, the fact was discovered that a prospective employee was infected, he was rejected out-of-hand. Expressions of deep solicitude for the retirement funds were made to explain the policy. A real interest in the retirement funds would have suggested that a policy of routine blood tests, plus the requirement of treatment, but without the policy of discharge, would be far more intelligent.

Or take this case from industry: Some months ago a young man applied for a job in an Eastern air-craft engine factory. His qualifications as a machinist were found to be high. He was hired. After a week's work he was given a physical examination, which included, as all good physical examinations should, a blood test. His blood test was positive. He was fired.

A few days later he became the patient of a prominent Eastern syphilologist. He gave a history of having had a primary chancre some years before. The doctor that he consulted treated it with a "powder," probably calomel. When the secondary rash appeared, he had been advised to take baths in a solution of baking powder. These also had disappeared. Until the time of the blood test he had had no knowledge of the true nature of his disease. It may be fairly said that his condition was due to the negligence or ignorance of the "physician" who originally saw his case.

This patient was willing to take treatment, eager to do so. His inability to secure a job, however, jeopardized his ability to pay for such treatment.

The syphilologist protested to the company. He pointed out that in that stage of the disease treatment was a definite bar to central nervous system complications and a definite protection from infection. The cure was almost certain. He offered to report from time to time on the progress of treatment. At the time the last correspondence relating to the case came to the Public Health Service the syphilologist had not received any reply from the company.

I need hardly say from the point of view of modern medical science that the syphilologist was right; the company was wrong. There was no element of risk involved in this case. By way of contrast it might be worth while to note that in the routine physical examination given to commercial pilots who fly the planes that use the motors that were built in the plant, who have the lives of passengers and the safety of expensive equipment in their hands, the blood test is not included. Yet *only* the blood test can reveal syphilis in the latent stage.

Or take another case from real life: The wife of a member of our staff was riding home in a nearly empty bus one evening when a talkative lady sitting next to her began to discuss the awful case of her maid. The girl, it seems, had been too insistent about her Thursday afternoons off. She had let slip the fact that she was going to her doctor and the scandalized housewife discovered that she had been under treatment for syphilis for nearly a year. The housewife, being highly moral and very timid, fired the maid.

Now obviously, the lady was not one who was systematic enough to ask a routine blood test in advance. Obviously, too, the maid belonged to that small fraction of syphilitics tenacious enough to continue treatment over an extended period. She was non-infectious and of no danger to anyone; in fact she was far safer than many whose blood test showed negative a week or so before.

This, though not a case of industrial employment, is nevertheless typical of many management decisions with regard to syphilis. It is not dissimilar to the policy of the Civil Service Commission, as cited a few moments ago. Each of you can probably recall a dozen or more similar cases from your own experience.

These cases are worth citing because they emphasize the need for a careful consideration of syphilis and the job. One can lay down broad policies, but one must exercise administrative judgment within the ambit of those policies in terms of three variables: (1) the particular job, its requirements and responsibilities; (2) the particular syphilitic, the stage of the disease and the treatment taken, and (3) the labor policies of the industry.

WHEN one considers the job there seem to be four principal sorts of human relationships involved. Three of these concern industry—the other, the individual job, is more or less distinguished by the fact that it is not integrated into a larger enterprise, the job of the farmer, the artist, or the prospector, for example.

Of most obvious concern when one considers syphilis is the *personal contact job*. This group would include the food handlers, the hotel help, barbers, beauty parlor workers, Pullman porters, matrons, nurses, school teachers, and all whose work brings them into intimate personal relations with other people. It is these that present the greatest possibility of chance infection.

Considered in terms of the various stages of the disease, it is the first stage that is of most impor-

tance. The latent syphilitic is not likely to transmit an accidental infection. A paretic cook may spoil one evening's broth, but he is not apt to pass his syphilis on to anyone else. But the primary and secondary stages, when chancres, skin rashes, or mucous patches appear, are important. Anyone who has responsibility for this group of workers must keep high his index of suspicion whenever a skin lesion of any kind appears. The darkfield should be freely employed to discover the early cases in that 10- to 20-day period of the first chancre, before the blood turns positive.

The second job group in which syphilis is of importance to industry is the *job of responsibility*. The air pilot or the engineer, responsible for the safety of passengers, the operator of switches or interlocking systems, the train dispatcher, the crane operator, the executive with his financial responsibility for the management and finances of the enterprise, all would fall within a group which presents no extraordinary opportunity for accidental infection, but in which mental or physical failure under stress may have disastrous consequences to the safety of their fellow workers, the public, themselves, the equipment, or even the company.

Among various stages of the disease the first stage has only its public health importance. It is the latent stage and the incipient later stages which concern us. The need of periodic blood tests, of insistence on treatment which will arrest the disease before it enters the central nervous system or threatens an internal organ with aneurysm, is evident. Only the blood test will find syphilis at this stage. You are dealing, moreover, with an extremely valuable group of employees. These complications come in late middle life. The longer their seniority and training the more valuable they are likely to be; the higher they have risen in rank and leadership the sounder is the industrial policy which makes their cure a responsibility of industry.

There is another sort of job group, which I might call, for want of a better term, the *routine job*. Here will fall many of the operators of individual machines, janitors, helpers, and clerks. They present on the one hand no unusual problem of chance infection; on the other hand no physical or mental failure would have large consequences to the work, their fellows, or the patrons of the company.

This group of workers presents a problem which is present with the two classes mentioned before. I did not emphasize this because hazards of infection and safety were dominant considerations. If they have syphilis they are sick men. That fact must not be obscured by the fact that they are not bedridden. If they have early syphilis they have an infectious skin lesion which may be passed either venereally or by chance contact to others and will almost certainly be passed to their wives and children. If they have latent syphilis, however complete the apparent peace they have made with the spirochete, there are data to indicate that they are not the efficient employees they would be without latent syphilis. It is true that there are no accident statistics to cover this point. One can find countless cases to illustrate the slow healing of wounds or bone structure in the case of syphilitics. One can find compensation claims paid for injuries which better medical advice would have set down to syphilitic infection rather than accident. How large this sort of thing bulks in the annual budget of a large industrial organization may be a matter of dispute. It is certain, however, that half a dozen such cases a year would bulk much larger than the cost of a company program for the control of syphilis.

Let us not forget this as we discuss the hazards of syphilis: There is a silver lining to the problem. Treatment is specific, certain in results. It is long, but no other serious disease yields so definitely to the physician. All these hazards are unnecessary if syphilis is found, through routine blood tests, if treatment is available and adequate.

TWO years ago an advisory committee to the United States Public Health Service was formed to consider the establishment of state and local programs for Venereal Disease Control. It included health officials, leading syphilologists. They sifted the experience of Sweden, Denmark, Great Britain, and leading states and cities of this country. They drafted a program which would serve as a blue print for states and municipalities which were setting up public health facilities against syphilis. From social security funds $8,000,000 had been set aside for public health activities. With new funds available, states which had allowed venereal disease control to atrophy were rehabilitating their programs.

That program recommended among other things, free laboratory service available to physicians and private medical services throughout the state. It should be possible, in any state with a well organized program, for companies, such as those you represent, to send your blood or darkfield specimens to a central state laboratory for analysis and report.

Such facilities are not yet universal. Where such state laboratories exist they sometimes refuse to perform tests on the large scale required by industrial concerns. There are two answers which may be given: The service is an integral part of the state's program of venereal disease control. It is one which you may properly insist on, using every appropriate resource of pressure to secure it. On the other hand, with the great growth of interest in venereal disease control, many state laboratories cannot expand their facilities rapidly enough to meet these needs. If satisfactory contract arrangements cannot be made with private laboratories, the cheapest way to secure performance of these blood tests would be the hiring of a technician to perform them in your own laboratory. It is work which would not, after the first few weeks, take the full time of the technician. There are, I believe, few medical staffs that could not make effective use of an additional laboratory person of this type.

This is the solution to the problem applied by Dr. G. H. Gehrmann in Du Pont's outstanding

program of syphilis control. Tests were done by the company laboratory. Positive results were checked by second specimens and tests. If no definite history of the disease was found, positive tests were double checked by work in independent laboratories.

In Dr. Gehrmann's original program the men were then directed to consult their private physicians. The latter were supplied the necessary information with reference to the patient. But Dr. Gehrmann's experience with private treatment of syphilis was not always good. As some clue to what you yourselves may find—perhaps you have already found it—I will quote his own comments on the work. He says: "Each case has been followed persistently by the staff of the medical division to insure continuous treatment, and it is through this follow-up of employees who have been referred to their own physicians for treatment that so much has been learned of the difficulties which make the present plan of handling these cases seem unsatisfactory.

"The findings are enumerated:

1. Very few refuse to take their treatment.

2. Most physicians demand prices for treatment that are beyond the means of the individuals and out of reasonable proportion to their incomes. Some physicians maintain these high prices despite the fact that they are receiving arsphenamine, neo-arsphenamine, and bismuth free of cost from their state.

"3. Many physicians refuse to treat the referred cases, stating that no treatment is indicated, in spite of four-plus Kahn and Wassermann reactions although the cases have never received adequate treatment.

"4. Numerous physicians refuse to admit that their patients have syphilis (again in the face of four-plus Kahn and Wassermann reactions). This group denies the validity of blood tests and states that they have known their patients for years, and further know that these same patients could not have contracted syphilis without their (the doctors') knowledge.

"5. On several occasions the attending physician has sent a blood specimen to a private or state laboratory and the report has come back that the reaction is negative. In every instance the results obtained by the company laboratory have been corroborated by subsequent check, but the attending physician has not always admitted that the patient has syphilis.

"6. Many cases are discharged as having had sufficient treatment, after three to 10 injections of neo-arsphenamine without a heavy metal.

"7. Some have been reported as being well after a few mercury inunctions or a few intramuscular injections of water-soluble bismuth.

"8. Some are being treated with pills and nothing else.

"9. Treatment at the free clinics is very satisfactory but it is not always possible for employees to conform to clinic hours, and in some places the clinics refuse to treat any patient who is employed.

"The evidence (he refers here to the entire report) presented above indicates that the incidence of syphilis in industry is of sufficient extent to be well worth consideration both from the standpoint of public health and industrial risk. The problem of getting these cases adequately treated is extremely difficult, and the question arises, is it advisable for industry to assume the entire obligation of treating these cases?

"There is no question but that this work is well worth while, and there is no question about the adequacy of the treatment which the majority of these infected employees receive. But it does seem advisable for the industry to take over the entire management of these patients and thus insure to them continuous and proper treatment."

At some of the Du Pont plants Dr. Gehrmann has since that time instituted the policy of treating employees suffering from syphilis. His reports would indicate the wisdom of the policy.

IN CONCLUSION I will say this: I know full well that in the case of some roads I am carrying coals to Newcastle. Sometime ago we made a brief survey of industrial syphilis control programs. We found, as might be expected, that railroads headed the list; not enough railroads, perhaps, are undertaking this work, but more proportionately than among industrial plants.

One railroad reported to us that it had given blood tests to 45,000 employees, another had tested 20,000, another 16,000, and another 8,000. Of 15 roads which sent the fullest reports, and which employ 414,684 of America's million railroad workers, 119,535 had been tested.

Reports which were received on policies indicated that there are still too many roads which follow the outworn policy of rejecting applicants, slightly more than half. More than half the roads require the employee found to have a positive Wassermann to take treatment.

How far can a plant go in securing the support of its employees for such a program? That depends on you as medical officers. The program is one which will improve the health of the men and their families, improve the safety of the job. Three years ago the Brotherhood of Locomotive Firemen and Enginemen ran a series of nine articles in the union magazine, discussing the threat of the venereal diseases. Fine work has been done by the Brotherhood of Railway Trainmen as incident to its fine program of hospitalization of tuberculosis. Employees are alive to the problems of health. The medical officer who runs his department on a professional basis, who maintains a physician's relationship with patients and a physician's responsibility toward them, will secure employee cooperation. It is only when the industrial medical department surrenders the independence of professional relationships to extraneous management policies that any problem can arise.

Finally, I would like to emphasize this point, which has been heretofore made by the Surgeon General: "There is no intention on our part of setting down a closed policy for the industrial control of syphilis. Neither do we propose to set forth the average of existing practice, as an optimum policy." That policy which we heretofore

used in the drafting of recommendations for State and Local Programs for Venereal Disease Control, the drawing together of a professional advisory committee, to consider and to report, is a much sounder and more flexible device for the governing of relations between the Public Health Service and industry. Meanwhile, we will render to any and all of you whatever aid we can in consultation on technical problems of diagnosis and treatment, or in the procedures to be followed in putting your program into operation.

Management of Gonorrhea

—Present Status—

Russell D. Herrold, M.D.,
Chicago

IT IS, perhaps, unnecessary to emphasize before this group that gonorrhea has no competitor among infectious diseases in regard to a high incidence of infection.* I believe it is generally agreed that 60% of the male population at the age of 50 years have previously had one or more gonococcus infections. No doubt one-fourth of women at the age of 50 years also previously have had gonorrhea. It would seem conservative to estimate that there are a million active infections in the United States annually. The time is too short to emphasize the many untoward sequellae of gonococcus infections, but just as one example that could be mentioned is the fact that it is the chief etiological factor in sterile marriages.

It would seem appropriate to discuss briefly a few factors bearing upon its epidemiology. You will note that more than 25% in a series of 400 patients had had a previous infection. Also that while a great majority of patients had an incubation period of less than eight days, there is a significant number longer than eight days. Approximately two-thirds of all patients are under the age of 30 years, with the greatest incidence between the ages of 20 and 24 years. In the male, nearly one-fourth of all infections are in married men, and I believe, conservatively, that 50% of such married men infect their wives either during the incubation period or after it is thought that they are no longer infectious. The source of infection from prostitutes as compared to clandestine exposures would seem to be definitely greater in England as compared to America.

In the management of gonorrhea in the male it cannot be emphasized too strongly that, except in the acute stage of infection, smears of the urethral discharge are inferior to those of other sources. It is particularly important now with the new chemotherapeutic method of treatment where urethral discharge frequently disappears promptly during the course of treatment and consistently before there is bacteriologic cure. Without exception Gram stain should be used by the physician, or smears should be sent to a competent laboratory, particularly where there is any doubt as regards the diagnosis, and as a routine in the determination of cure. Shreds from the urine can be quickly prepared and examined as a guide of progress during treatment, but in the final determination of cure, the sediment of the first urine voided, the prostatic secretion, and the sediment voided after prostatic massage should supplement the shred examinations. A small amount only should be voided for such centrifuged specimens in order to obtain for smears a fair sample of the whole pus cell content. Since cultural methods are not, in general, available at the present time the final smear should be associated with provocative tests, and after these are negative follow-up clinical observation should be carried out for a suitable period of time. This period varies according to the individual patient, since those who are known to have had posterior infections should not be released as soon as those who have had infections that were limited to the anterior urethra. Not all of the possible provocative tests are necessary in every instance, and again it is an individual problem. For instance, if a patient has never had a previous infection, and the present gonorrhea is known to have been cured while limited to the anterior urethra, it is not necessary to pass sounds through the anterior-posterior urethra. Massage of the prostate, however, should be done in every instance before the patient is dismissed, not only to detect an overlooked posterior infection, but also to rule out a coexisting non-specific dormant or silent prostatitis. The carrier or subclinical state following the use of sulfanilamide is perhaps shorter in most instances than during previous methods of treatment, yet with many patients I have seen a definite symptomless state following the discontinuance of the drug as determined when one makes Gram stains of all the exudates as described previously. Further observations will be needed to determine the incidence and average duration of subclinical infection after sulfanilamide therapy. It has been noted, however, that those patients with acute infections who clinically seem to be cured during the first two or three weeks of sulfanilamide medication are more likely to have a definite clinical exacerbation within three to seven days after the discontinuance of the drug. This would be as expected, since a carrier state necessitates a partial specific immunity in order for the infection to exist without clinical symptoms, and such state would require at least two to four weeks to develop.

It is unfortunate that no simplified method of culture has been developed that could be used universally in the same manner as is concurrently used in the management and control of patients with diphtheria. To obtain maximum epidemiological control, even with the use of specific chemotherapeutic measures, cultures will still be needed, particularly in the female. There has been some advance along this line during the past two years, but as yet no method is satisfactory for generalized use. Biologic methods are a poor substitute for the careful examination of smears where these include every available suspected exudate. If the physician does not feel qualified to make an accu-

---

* Read before the Congress of Railway Surgeons, September 22, 1937, Chicago.

rate examination of smears, then a laboratory should be relied upon for such examinations, particularly before the patient is dismissed as cured. However, he should know how and where to collect the suspected exudates, and to make smears properly, particularly not too thick, in order to give the laboratory opportunity for optimum efficiency.

The general consensus of those who have conservatively analyzed the results of fever therapy are opposed to its use as a routine measure for uncomplicated gonococcus infections. Its use is accompanied by a great deal of physical discomfort to the patient and some danger of morbidity or mortality. It was more generally agreed that it should be used for acute gonorrheal arthritis and gonorrheal ophthalmia in adults, which conditions by other means were frequently followed by ultimate serious morbidity. Already it has been suggested that fever therapy be used as an adjunct to chemotherapy with sulfanilamide. In a small per cent of selected patients such combined measure will no doubt be found of value, particularly where there is no favorable response to sulfanilamide alone, or where there is intolerance to sulfanilamide in dosage sufficient to obtain bacteriostatic effects.

In regard to sulfanilamide, the beneficial effect in gonorrhea is that of a chemotherapeutic agent, since it is dependent upon the free para-aminobenzenesulfonamide in the excretions of the prostate and submucous tissues. A small per cent of its benefit may be due to excretory irrigations. It is probable that the percentage of the free drug in the tissues infected with gonococci is slightly less than that of the blood serum itself. There are probably three or four variable factors that may explain the failures on patients with the same dosage per weight. One factor would seem to be the amount of the free drug in the tissues as compared to its conjugate, the latter being considered more or less inactive. Also, there may be a greater resistance of some strains of gonococci to the drug in a like dilution. In the test-tube, approximately 1:10,000 dilution is needed to kill the gonococcus within two days. Again, in test-tube experiments, the gonococcidal action seems to be somewhat in proportion to the number of gonococci subjected to a given dilution.

It is of the greatest importance to know the optimum dosage that will be tolerated by the greatest per cent of patients. While it is obvious that in general the greater the dosage, the greater the expected favorable result, yet many patients will be unable to tolerate extremely large dosages for a sufficient period of time to assure cure. Since, in the practical management of gonorrheal patients, it is necessary for them to be ambulatory, such large dosage increases the danger of the more serious reactions even if there is close cooperation between the physician and the patient. Consequently the patient should be seen every 24 to 48 hours while taking the larger amounts of the drug. On the other hand, small dosage such as 20 to 30 grains daily is not sufficient to produce a favorable response in acute infections, and usually insufficient to prevent posterior involvement in a substantial percentage of patients.

During the past six months we have varied the dosage a great deal in order to attain a practical optimal dosage satisfactory for adult ambulatory patients. Our results would seem to indicate the impracticability of attempting the so-called maximum of 80 grains daily as a routine procedure for non-hospitalized patients. However, most patients have tolerated three-fourths of this amount quite satisfactorily for a period of two to four days, preferably two days as a routine, after which one-half maximum dosage, or 40 grain daily, is given for an additional period of from five to seven days, followed by a dosage of 30 grains daily as indicated by the clinical symptoms and laboratory analysis. The above amount seems necessary to control severe infections. A rest period should be given not later than the twenty-first day, regardless of the status of infection at this time. The dosage and duration of treatment is somewhat of an individual problem, as some patients, particularly with mild infections, do well on an initial dosage of 40 grains daily.

IN VIEW of the variable dosage used in this series of 50 adult patients, there will be no attempt to give exact statistics on the percentage or time of cures. However, not more than one-third were cured under a period of two or three weeks as determined by the examination with Gram stain of urine sediments. On the other hand, where the patients were able to tolerate the drug, less than 20% of new infections developed any symptoms of posterior infection. This, I believe, is a very important accomplishment since in itself it will reduce the period of infectivity very substantially as compared with the former methods of treatment. In most instances, our outstanding failures have occurred in those patients with well-developed anterior infections of five to 10 days' duration before treatment was instituted, and in some acute or subacute posterior infections. The acute symptoms have promptly subsided in acute prostatitis and acute epididymitis almost without exception, giving prompt clinical relief after one to three days of medication.

Apparently there is a wide variation in the sensitivity of patients to sulfanilamide. In general, systemic reactions are proportional to the amount of the drug administered, but in a small per cent of patients the drug cannot be tolerated sufficiently to accomplish anything in the treatment of gonorrhea. Malaise and headache are the two most constant symptoms, and in my experience there has been a great difference in the extent of these symptoms on a dosage of 60 grains daily as compared to 40 grains daily. Sulfanilamide fever has not been emphasized sufficiently. It is frequently preceded by a chill or chilly feeling. The temperature usually reaches a height of 102° to 104° and gradually subsides to normal in two to four days on the discontinuance of the drug. This complication must be recognized promptly, the drug discontinued, and a large amount of water administered. In the management of ambulatory

patients it is important to explain some of the possible reactions so that the patient will consult the physician immediately, or discontinue sulfanilamide on his own judgment at the onset of any untoward reaction. Unless an improved product is found, I believe that the dispensing of sulfanilamide without prescriptions will have a self limited course, since druggists will soon be alarmed after an experience or two of systemic reactions. Also, it is advisable for physicians to mark the prescriptions "non-refillable." We have not had any severe blood dyscrasias, such as hemolytic anemia or sulphemoglobinemia. However, they must be kept in mind since they are known to occur, but in most instances have followed the use of a large amount of the drug.

WHILE I appreciate that this group is not particularly interested in gonococcus vaginitis, I should like to discuss briefly a series of such patients who have been observed in cooperation with Drs. S. J. Hoffman and M. Schneider. A detailed report will be given in another communication. This group is particularly valuable because all the patients were under hospital control during the administration of sulfanilamide, and for a short period after its discontinuance. All these patients were given the same relative dose, according to weight, for a period of 21 days, after which there was a rest period of one week. Larger dosage was used during the first week as compared to the second and third weeks of treatment. It is generally accepted that vaginitis infection in children is less commonly cured spontaneously than any other type of gonococcus infection. Also, previous methods of treatment have been most unsatisfactory. Therefore, observations of such a series of patients should give a good criterion of what can be accomplished from sulfanilamide. Analysis of the results brings out many interesting points. It will be noted that no cure was obtained under a period of 16 days. Seven patients were cured between 16 and 21 days. The fact that more than one-third (nine patients) of this group were cured during or by the end of the second course of treatment (35 to 49 days) would seem to indicate that little was lost by a rest period of one week between the first and second courses (twenty-first to twenty-eighth days). It would seem logical that such rest periods would add to the safety of its administration where longer periods are needed to cure. It suggests the advisability of not trying to make any time records as to the period of cure, but rather to lean to methods of safety, even though it may require a longer period to eradicate the infection. I think we must realize that even though sulfanilamide is satisfactorily absorbed through oral administration, yet it must be watched as carefully as the parenteral use of the arsenicals in syphilitic patients. Certain systemic reactions are less likely to occur in children as compared to adults. It is particularly striking that gastro-intestinal disturbance was almost negligible. On the dosage given there was no evidence of cyanosis, which symptom we believe indicates excessive dosage for ambulatory patients. I do not think that the albuminuria in one instance was due to irritation of the kidneys. We have seen no evidence of kidney damage in adult patients. Irritation of the kidneys with sulfanilamide would not be expected since under the largest dosage it is not excreted in the urine in a concentration much greater than 1:400, whereas it can be given subcutaneously and intra-spinally in a dilution of 1:120.

Finally, while sulfanilamide is not a "cure-all" it has already established itself in a permanent place in the future management of gonorrhea. I think every patient with gonorrhea should be given the benefit of a trial on sulfanilamide if there are no contra-indications to its use. It leaves much to be desired, because of systemic reactions. No doubt, improved products will be available in the future. Since the period of infectivity will be shortened in a large group of patients, a substantial reduction of gonococcus infections can be expected within the next few years. It cannot be emphasized too strongly that its use is not without danger, and should be administered with the closest cooperation between patient and physician and a constant watch for prodromal signs and symptoms of untoward reactions.

Discussion:

DR. ROBERT M. GRAHAM, Chicago: I have been asked to discuss Dr. Herrold's paper primarily from the industrial standpoint, probably because of the fact that I have been interested in this phase of the problem for a number of years. His reports have given definite hope for this new form of drug and he has shown us the danger signals.

Under previous methods of treatment it has been estimated that 70% of gonorrheal urethritis in the male becomes posterior, and this percentage is larger in poorly treated or untreated cases. It is gratifying to learn that in Dr. Herrold's series, new cases coming to treatment early have been kept anterior in 80% of the cases, with sulfanilamide and local treatment, although he has not given us the hope of a quick cure as compared with fever therapy.

The acute case usually offers little difficulty in diagnosis, if proper examination of smears is made. The chronic uncured case who has no active symptoms or trouble and has stopped treatment under the assumption he is cured, presents serious difficulties to the physician handling industrial cases, on account of the frequent complication of epididymitis, backache, prostatitis, arthritis and occasionally iritis with which the patient presents himself to the physician as a case of injury.

The medicolegal aspects of this type of case make the proper diagnosis of almost as much importance as the proper treatment. I decry the use of the term "strain" in the diagnosis of any phase of gonorrhea, unless there is a clear cut occupational accident.

For this reason Dr. Herrold's remarks on the value of cultures and complement fixation tests in average hands are not encouraging. I believe we can in the near future depend more and more on the results of these methods as their technic becomes more standardized.

I think we can agree with the opinion expressed by Dr. Herrold that general fever therapy should be limited to the treatment of severe complications, such as arthritis and ophthalmia. It is important to note that the percentage of cures reported by workers with fever therapy is not increased over those treated with previously accepted methods, although the results in individual cases have sometimes been remarkable.

Dr. Herrold did not discuss the use of sulfanilamide in the cases of gonorrheal arthritis. Theoretically it should be effective, and we will probably have more specific information on this problem in the future.

Spink and Keefer, in a recent issue of the *Journal of the American Medical Association*, reported on a series of 70 cases of acute gonorrheal arthritis, 13 of which presented no symptomatic evidence of localized gonococcic infections of the genito-urinary tract. Diagnosis was made by (1) examination of the synovial fluid for microorganisms; (2) gonococcus complement fixation test on blood; (3) isolation of organisms from possible focus of entry; (4) course of the disease. They did not use sulfanilamide in the treatment of these cases.

The use of sulfanilamide and its associated products is still in the experimental stage. Like fever therapy, it can be quite harmful to the patient when carelessly used, but is probably much safer. The results of delayed toxic reactions have not been fully determined. It took several years after dinitrophenol was in general use before it was discovered that it sometimes caused cataracts.

Although Dr. Herrold has had no serious complications, he has seen the danger signals and has stopped treatment before serious damage has occurred, and he has been very careful to stay below the maximum average dose. If this method of treatment is adopted by the corner drug store, we will probably have ample opportunity to discover and treat many of the complications from use of this drug.

Dr. Herrold did not mention prophylaxis and epidemiologic study of contacts. More persistent use of both in the management of gonorrhea will, I believe, be of definite aid in eliminating this disease and cutting down the doctor's work.

DOCTOR: I have noticed in using sulfanilamide a number of my patients have become quite anemic. I noticed by Dr. Herrold's charts that he has continued the use of iron and liver during treatment of the child. I wonder if he has done so with the adult? I would like to ask also how much time he gives for the rest period before continuing the second and third courses of treatment.

QUESTION: I would like to ask about the untoward effect of using epsom salts, etc., with sulfanilamide in gonorrhea?

DR. RUSSELL D. HERROLD: Chicago (in closing): Most of the children in our series had a definite secondary anemia on entrance and it is routine to begin treatment with liver and iron, so we continued this procedure while we were giving sulfanilamide. I have used liver and iron in adult infections occasionally.

In only one instance did we notice a marked drop in the blood count, and the hemoglobin did not drop below 50%. She was continued on sulfanilamide together with liver and iron and the anemia became less marked.

As regards the length of rest periods, in the series of vaginitis infections, we let them rest as long as they are negative after the first course. If they get a recurrence, then we resume treatment. If the test is still positive at the end of the first course of treatment, we start treatment again, after one week of rest. The same procedure is followed after the second course and depends upon the smears.

I have not given sulfanilamide to any patients with gonorrheal ophthalmia, although there are reports of favorable results.

We warn patients that Epsom salts or other sulphates are contra-indicated when using sulfanilamide because, if used together, there is thought to be a predisposition to sulfhemoglobinemia.

Industrial Health Council

FOR more than two years the Board of Trustees of the American Medical Association had under consideration the advisability of establishing a council the function of which would be to deal with matters pertaining to occupational disease and other phases of the subject of industrial health.*

A committee of the Section of Dermatology and Syphilology has for several years interested itself in the problems growing out of the widespread incidence of industrial dermatoses, and at the Kansas City session in 1936 a resolution was submitted to the House of Delegates by Dr. A. R. McComas, of Missouri, requesting the Board of Trustees to continue and enlarge its study of industrial hygiene and occupational diseases and to provide for active participation in well directed efforts designed to effect better control of occupational disease.

In March, 1937, a conference was held in Chicago, which was participated in by the members of the Executive Committee of the Board of Trustees and by a group of distinguished physician who have given special study to the general subject of industrial hygiene. At the Atlantic City session the Board of Trustees submitted to the House of Delegates the recommendation of this conference, to the effect that a council, to be known as the Council on Industrial Health, be established and maintained by the American Medical Association. This recommendation received the approval of the House of Delegates, and the Board of Trustees has taken steps to establish the Council on Industrial Health and has appointed the following members, all of whom have agreed to serve:

DR. STANLEY J. SEEGER, Milwaukee, Chairman;
DR. HARVEY BARTLE, Philadelphia;
DR. WARREN F. DRAPER, Washington, D. C.;
DR. LEROY U. GARDNER, Saranac Lake, N. Y.;
DR. MORTON R. GIBBONS, San Francisco;
DR. H. H. KESSLER, Newark, N. J.;
DR. A. D. LAZENBY, Baltimore;
DR. EARL D. OSBORNE, Buffalo, and
DR. C. W. ROBERTS, Atlanta, Georgia.

The organization of the Council on Industrial Health will be perfected at a meeting to be held December 10, at which will be decided the plans for outlining the nature and the scope of the Council's activities. The creation of the Council on Industrial Health is another indication of the desire of the American Medical Association to do all that it can to promote the art and science of medicine and the betterment of the public health. It is, of course, confidently expected that the medical profession throughout the United States will support the work of the Council.

Midwest Conference

THE Midwest Conference on Occupational Diseases will be held at Chicago, in June of this year, in conjunction with the Twenty-Third Annual Meeting of the American Association of Industrial Physicians and Surgeons. The Conference and Meetings will convene at the Palmer House, on June 6, 7, 8, and 9, 1938. The Committees in charge are the Program Committee, of which DR. EDWARD C. HOLMBLAD is Chairman, and the Exhibits Committee, of which DR. WILLIAM A. SAWYER is Chairman. For the first time in the history of the Association, its convention will feature scientific and commercial exhibits.

* Editorial, *J.A.M.A.*, *December* 11, 1936.

Dinitrophenol

—A Review of the Literature—

MAURICE HARDGROVE, M.D.,
and
NANCY STERN, A.B.

DINITROPHENOL is a drug of the benzene ring which was studied as early as 1885. At that time Cazeneuve and Lepine[1] noted that dinitronaphthol (a drug closely related to dinitrophenol) increased the metabolic rate in dogs. In 1891 Gibbs and Reichert[2] repeated this work and confirmed the drug as a metabolic stimulant. It was then forgotten for many years although used industrially as early as 1900. Though it was frequently noted that workmen who inhaled the fumes or dust or handled the drug became ill, it was only in 1915 that a complete study of dinitrophenol and its toxicity was made by Magne.[3] It was not until 1928 that the substance was considered for medical use. At that time Heymans studied dinitronaphthol.[4] In 1931, Van Uytvanck,[5] working in Heymans' laboratory, repeated Cazeneuve's and Lepine's work. The following year Magne, Mayer, and Plantefol,[6] in France, recommended the use of dinitrophenol as a metabolic stimulant and a therapeutic agent in obesity. Simultaneously, Cutting and Tainter[7] introduced it into this country. They stated: "Dinitrophenol is of definite value as a drug for the treatment of obesity and perhaps some other metabolic disorders. In the hands of the medical profession it can be used with the maximum benefit and with minimum deleterious results."[4] Shortly afterward the author of an editorial in the *Journal of the American Medical Association* implied that the drug had value when carefully administered.[8] The drug soon became immensely popular. By October, 1934, Tainter, Cutting, and Stockton estimated that over 100,000 people in the United States had been treated with dinitrophenol, and it was also widely used in Canada, Great Britain, France, Sweden, Italy, and Australia.[4] It was not only prescribed by physicians, but it was also added to proprietary medicines available over the drug store counter without prescription.

Uses of Dinitrophenol

SINCE the therapeutic use of dinitrophenol was described, it has been suggested for a number of medicinal purposes. The most important one has been the treatment of obesity. Cutting, Mehrtens, and Tainter[9] advocated three to five milligrams per kilogram of body weight daily as an amount which would increase the metabolism 20 to 40% and induce an average weight loss of two to three pounds a week. The authors warned physicians against larger doses, and pointed to the fact that some patients had an idiosyncrasy for the drug. Dinitrophenol's main advantage, these writers claimed, was the fact that administered in small amounts it had no effect on temperature, respiration, or pulse, and that there were "no deleterious symptoms, such as hyperirritability caused by equivalent doses of thyroid gland." This glowing praise of dinitrophenol was made in 1933.[9] In August, 1935, Tainter and his associates[10] modified their recommendation somewhat when they published the results of dinitrophenol administration to 170 patients (average daily dose 0.34 grams) for 88 days. The average weight loss was 1.4 lbs. per week. There were no changes in the blood picture, but skin rashes and peripheral nerve changes were noted in 25% of the patients on high doses. The drug was discontinued in those cases in which toxic reactions were observed. In two cases of skin lesions, it took the patients a week to recover. The sensory changes lasted an average of three weeks after the drug was withdrawn. At this time the authors suggested that dinitrophenol should only be given when other drugs had failed, although they still recommended its use when carefully administered.

Dinitrophenol has also been used to increase metabolism in psychobiologic underactivity. Looney and Hoskins[11] administered 3-4 mg./kg./day to 10 schizophrenic patients for 49 days. They increased the basal metabolic rate 50%, and, although the patients lost two to three pounds, no harmful effects were noted. Masserman and Goldsmith[12] gave 5 mg./kg./day to 13 patients with low basal metabolic rates and psychiatric disorders. One patient died (the case will be discussed later) and four others developed symptoms of intolerance. Six cases showed definite signs of mental improvement. For this reason, the authors believed that careful administration might benefit psychiatric patients.

Three other uses for dinitrophenol have been mentioned. Handovsky[13] suggested its administration in the treatment of cancer because of its alleged power to prevent cell division. He also suggested its use in fever therapy because large amounts of the drug induce a rise in body temperature. It has been found useless in the treatment of myxedema.[5]

Toxic Effects of Dinitrophenol Administration

SKIN LESIONS: In spite of benefits derived from dinitrophenol, the disadvantages of the drug seem far to outweigh its advantages. Skin lesions have been the most common manifestation of dinitrophenol intolerance. Pruritic maculopapular erythema, hemorrhagic bullae, exfoliative dermatitis, and urticaria have been reported. Tainter, Stockton, and Cutting[15] have estimated that about 7% of their patients taking dinitrophenol developed skin reactions, and in their series urticaria was twice as common as the maculopapular erythema[10]. Fifty-one cases of skin reactions have been directly recorded[15-29] although there are many more which appear in case reports

* From the Departments of Pathology and Medicine of Marquette University School of Medicine, Milwaukee, Wisconsin.

among other symptoms of dinitrophenol poisoning. The mimimum dosage reported to have been followed by skin lesions was 0.693 grams; the maximum, 5.0 grams; the average is not easily determined because dosage was not always precisely reported. Apparently there is a wide variation in susceptibility.

Beinhauer[16] has presented a typical instance of urticaria following dinitrophenol ingestion. The patient, a woman, took a total of 5.0 grams in 37 days at the end of which time there was swelling of the eyelids, lips, and neck, and a severe pruritis involving the entire body. Physical examination revealed an acute angioneurotic edema of the face, lips and neck, and the entire body was covered with both small and large wheals, accompanied by intense dermographism. The hands and feet were red and swollen. The oral mucous membrane was inflamed and showed many herpetiform lesions. The liver was palpable and tender. Temperature was normal. Treatment consisted of daily colonic irrigations, high carbohydrate diet, topical soothing applications, colloidal bathing; 200 cc. of 50% dextrose were given intravenously the first day, 100 cc. the second, and 50 cc. on each of the following three days. The patient recovered from the acute stage at the end of five days, and the further course was uneventful.

Hitch and Schwartz[17] have presented a typical case of dermatitis following dinitrophenol. There was a severe skin reaction progressing from a maculopapular erythema to dermatitis exfoliativa. The patient had taken a total of 1.8 grams of dinitrophenol in two weeks after which a generalized pruritis developed followed by small erythematous patches on face and back, the condition persisting and growing steadily worse for eight months before the patient sought medical aid. Physical examination at this time revealed very many irregular scaly, beefy red, discrete, and confluent patches about 20 centimeters in diameter over the entire body. Many areas were desquamating. There were no mucous membrane lesions. A month after the patient was first seen she developed a severe exfoliating dermatitis with redness and edema of the skin, oozing of serum, universal scaling and crusting with loss of hair and nails. For three months she maintained an erratic fever which varied between 95.9 F. and 103.1 F., but finally recovered. Swett[18] has presented a severe case of the same type of desquamative dermatitis where not only surface epithelium was involved, but also the mucous lining of the intestines, colon, vagina, mouth, and nasal cavity was sloughed. Less severe cases of maculopapular erythema which have not progressed to dermatitis exfoliativa have been reported.[19,28,29] The treatment for this type of skin reaction has been diverse: sodium bicarbonate baths, diets of candy, milk, and water; calcium gluconate, ephedrine and epinephrine by hypodermic injection.[19]

In some of the reported cases the patients were determined to be allergic to a number of substances and had positive skin tests to dinitrophenol. The allergic phase of this subject will be dealt with in more detail later in the paper.

Visual Disturbances: When dinitrophenol was first recommended, its sponsors did not foresee that its administration would lead to the development of cataracts, yet 153 cases[17,18,21,30-50,61] have already been reported in the literature. Horner[30] estimated that from 0.1 to 1% of the people taking dinitrophenol develop cataracts.

Amounts of the drug ingested in these cases varied considerably. The average total amount used was 5.84 grams with a maximum of 126.0 grams and a minimum of 9.0 grams. The cataracts often developed after the patient had been taking dinitrophenol for a long period, the average time being 11 months after beginning treatment with a maximum of 20 and a minimum of three months. In some instances they developed after the drug had been discontinued. Rodin,[31] in his excellent summary of dinitrophenol cataracts, mentions a case of cataract forming 12 months after withdrawal of the drug.

Cogan and Cogan,[32] summarized 20 cases of cataracts following dinitrophenol. They stated that they were all instances of "cataracta complicata." The opacities occupied a subcapsular position, and there was an initial involvement of the posterior cortex which had an appearance of "brass filings." Horner[30] analyzed these pathological changes step by step and found that while vision is still normal there are bilateral faint-gray, dust-like opacities just beneath the anterior capsule of the lens, and that by retro-illumination the anterior capsule appears roughened, dry, or vacuolated. The posterior subcapsular layers show a "cloth of gold" appearance, but the nucleus and lens remain normal throughout this period. The lenticular change, after it begins, is rapid. Opacities invade the cortex, then the nucleus, and the whole lens becomes silken grey, later pearl-like in appearance. The next step is "segmentation" with dark wedgelike intervening spaces. The lens swells, the anterior chamber becomes shallow, the tension increases. Refraction usually becomes hyperopic, in some cases, myopic. This is the typical eye lesion caused by dinitrophenol, but there are two unusual lesions reported. Swett[18] gives the history of a woman who took approximately 1.8 grams of dinitrophenol in six days and developed symblepharon, and the eye was lost in consequence.

Frost[30] reported a cast of a woman who worked for three months in a factory where she was exposed to dinitrophenol and developed optic neuritis with secondary atrophy, suspiciously suggestive of dinitrophenol poisoning.

The treatment for dinitrophenol cataract is still a matter of discussion. Most authorities recommend surgery. Barkan[33] and his associates report 23 operations for dinitrophenol cataract. There were few complications, and after operation only two cases had less than 15/15 vision and most had 20/20. In a series of 17 operations, Horner[30] states that 14 were successful (a vision of 0.8 or better was obtained). Three cases required needling. None of the cases was improved by local hot applications, dionin, forced fluids, calcium salts, or

concentrated Vitamin C. On the other hand. Whedon[30] reports the disappearance of such a cataract after hourly hot water applications and repeated instillations of 4% dionin solution three times a day.

Kerr, Hosford, and Shepherdson[34] used thyroid extract in conjunction with dionin, glycerine, or subconjunctival salt injection to stimulate local circulation, and reported favorable results. Josephson[35] recommends Vitamin C, in the form of ascorbic acid plus food rich in glutathione. This, he maintains, reduces the swelling of the lens, and cell nutrition in the deeper layers is improved. He feels that as soon as treatment is stopped, the cataract retrogresses. Nevertheless, in conclusion it may be said that almost all operative cases reported have been successful, and the majority of authorities recommend this type of treatment.

The etiology of dinitrophenol cataract has been a matter of conjecture. Whalman[50] believes it similar to a traumatic cataract, in which the lens epithelium is damaged by a penetrating agent. Josephson[35] presents a different theory. He states that normally the lens has a high Vitamin C content which is diminished or totally depleted in dinitrophenol cataracts. The drop in Vitamin C is parallelled by a decrease of glutathione content which is part of the auto-oxidation system of the lens. Cogan and Cogan[32] feel there is a generalized anoxemia due to the increased basal metabolic rate. The tissues become acidotic, lactic acid is accumulated and decomposition products are insufficiently oxidized. The lens epithelium shares this general tissue anoxemia and is damaged. Its remote position from nutritional centers makes it more vulnerable than other tissues. Cataracts are caused by damage to lens epithelium rather than to lens constituents. This may account for the fact that they appear such a long time after dinitrophenol administration is begun or even after it has been discontinued. The cataracts are not likely to be caused by precipitation of lens substance, for lenses (removed intracapsularly) may be immersed in a 2% dinitrophenol solution without further opacity developing.

Tainter[33] feels that many women develop similar cataracts who have not taken the drug. Likewise many women have taken dinitrophenol without developing cataracts. When the drug is administered to animals opacities do not develop although they do occur when the animal is fed a diet containing excessive lactose with low or very rich Vitamin G content without dinitrophenol. There is much evidence against Tainter's arguments, for the large number of cataracts reported after dinitrophenol are probably not entirely due to coincidence.

Blood Dyscrasias: Blood dyscrasias have been intimately associated with dinitrophenol ingestion. Agranulocytosis has been the most frequent. The literature includes nine cases,[51-57] three of which were fatal. Dameshek and Gargill[52] mention 16 more cases which were brought to their attention. These patients ingested on an average a total of 13.91 grams with a minimum of 5.4 grams and a maximum of 36.5 grams. Silver,[51] and Dameshek and Gargill[52] give excellent descriptions of agranulocytosis following dinitrophenol. The patient often has a high fever, headache, sore throat, swollen cervical lymph nodes, ulcerating lesions in the tonsils, swollen and spongy gums, red fauces with patches of white exudate, dysphagia, a yellow tinge to the skin, and a palpable spleen. If the state is far advanced the patient may be cyanotic and semi-stuporous. The red blood cells, hemoglobin, and platelets are normal. The white blood cells vary between 2,000 and 500; the granulocytes between 10% and zero. There are no immature or abnormal cells seen. Generally the urine shows a heavy trace of albumin and occasionally a few casts, red blood cells, and white blood cells. Staphylococci or streptococci are often present in the throat culture. Silver[51] described a postmortem in which there was marked degeneration of the heart, liver, and kidneys; the bone marrow was hyperplastic.

Various types of treatment have been recommended for agranulocytosis. Dameshek and Gargill[52] contend that intravenous administration of adenine sulphate is better than intramuscular injection of pentnucleotide because it acts more rapidly and causes fewer reactions; one of their patients recovered after adenine sulphate when pentnucleotide had failed. Imerman and Imerman[57] favor pentnucleotide. In their two patients recovery followed its administration. The use of transfusion, intravenous injection of dextrose, and fluids, has been recommended, as supportive measures.

Agranulocytosis, it is believed, is often caused by certain drugs containing the benzene ring. Kracke and Parker[58] narrowed it to "benzamine" drugs, that is drugs which had the benzene ring with the attached NH_2 or NO_2 grouping. Dinitrophenol ($C_6H_5OH(NO_2)_2$) contains the benzene ring and NO_2. Why it should affect only the granular leucocytes is not known.

Hemorrhagic manifestations and anemia following dinitrophenol have also been described, although they are less common. Imerman and Imerman[57] report a case of agranulocytosis accompanied by anemia and purpuric manifestations.

A woman took 0.1 to 0.2 gram of dinitrophenol daily for a year. At the end of that time the blood count showed hemoglobin 62%, red blood cells 3,320,000, white blood cells 900, polymorphonuclear neutrophils 0%, eosinophils 6%, mature lymphocytes 92.5%, immature lymphocytes 1.5%, and platelets markedly diminished. The skin over the chest and axillae was covered with purpuric spots. Noun[27] also reported the case of a man who took a total of 2.86 grams of dinitrophenol in 22 days, in whom hemorrhagic spots appeared on the feet and ankles although there were no abnormalities in the blood picture.

Blood dyscrasias following the use of dinitrophenol are rare in comparison to the number of people who have taken the drug, yet there is apparently no way to determine which patients will develop agranulocytosis or other blood abnormalities. Even when the physician has taken

routine blood counts throughout the period of treatment with dinitrophenol, as in one of the histories included by Dameshek and Gargill[52], the onset of the disease may suddenly occur without warning. Blood dyscrasias constitute one of the greatest dangers of dinitrophenol administration.

PERIPHERAL NEUROLOGICAL DISTURBANCES: One of the less serious but still common forms of dinitrophenol intolerance is peripheral neuritis. It is often manifested only by loss of taste. Thirty-three cases have been reported,[10,15,17,22,23,47,59-62,93] and 14 of these had loss of taste.[10,15,22,23,50,60,93] This condition ceases soon after the drug has been withdrawn. The case reported by Epstein and Rosenblum[14] may be presented as typical. A woman took 0.1 to 0.5 gram of dinitrophenol a day for 16 weeks and then noticed a burning sensation and sharp shooting pains in the balls of both feet and in the toes. There was a low stocking analgesia and anesthesia of the left foot which extended from the exterior condyle downward to include the entire foot. The toes were quite red. There was hypalgesia to pinprick on all toes and the entire plantar surface of the right foot. She then took 0.5 gram a day in the following five weeks, and stopped for two weeks, during which time the condition of the feet remained the same. After another two weeks of medication neurological examination revealed analgesia of the soles of the feet and distal phalanges of all toes; hypesthesia was present over the remainder of the dorsal aspect of the feet and extended along the inner side of the calves. The drug was then discontinued and although some of the symptoms disappeared in two weeks, painful sensations in the soles of the feet remained for one more week. Nadler[59] says that neuritis after dinitrophenol is always of the sensory type, and that there are no motor or trophic signs although Tainter *et al.* report one instance of motor disturbance[10]. The condition generally starts in the toes with sensations of prickling, numbness, or pain, and spreads upward. Paresthesia often persists long after the drug has been discontinued. In Hitch and Schwartz's case[17] the paresthesia persisted for two months after dinitrophenol was stopped. The reason for the drug causing neuritis is not exactly clear, although it is a known fact that closely related substances such as benzene, dinitrobenzene, dinitrotoluene, trinitrotoluene have a latent toxic effect on the nervous system[59].

HEPATIC INJURY: Dinitrophenol is also capable of causing liver damage. In two cases of acute poisoning necropsy showed fatty infiltration and congestion of the liver[63,64]. MacBryde[23] gave intravenous injections of phenoltetraiodophthalein (liver function test) to eight patients taking dinitrophenol and six showed increased retention. Two other cases[65,66] of definite liver damage have also been described. Sidel's case[65] is interesting. A woman took 5.6 grams of dinitrophenol in two weeks. She then became tired, developed cramp-like pains in the epigastrium, and marked anorexia. She was jaundiced. The liver was palpable and enlarged. The stool was clay-colored, the urine was dark brown and contained albumin; specific gravity was 1.004 to 1.014, there were many pus cells, and the test for bile was strongly positive. The icteric index ranged from 80 to 100, and the Van den Bergh from 9.0 to 10.8. The treatment consisted of hospitalization, high carbohydrate, low fat diet, 10 units of insulin before meals, and sodium phosphate each morning. She improved gradually, but took nine weeks to recover.

RENAL INJURY: Dinitrophenol is reported to cause renal injury. In three of the postmortems in cases of acute poisoning[63,64,67], the kidneys were involved. Poole and Haining[64] reported that in their case the tubules showed various stages of degeneration—cloudy swelling, pyknosis or actual necrosis. The interstitial tissue was edematous, and there was much fine hematogenous pigment in the tubular epithelium. The capillaries, blood vessels, and arterial loops in the glomeruli were distended in places. There were small hemorrhagic areas in the pyramids. Two other cases of kidney injury have been described. Fribourg-Blanc[23] reported that a patient had gross hematuria after dinitrophenol. Rabinowitch and Fowler[5] described albuminuria in a patient who was given 6 mg./kg./day of dinitrophenol for three days. The blood urea nitrogen increased from 18 to 31 mg. per 100 cc. of blood; creatinine increased to 1.98 mg.; bilirubin content increased from 0.2 to 1.0 unit. This returned to normal three weeks after the dinitrophenol was discontinued. In passing it might also be noted that Tainter *et al.*[15] reported a case of cystitis which was thought to be due to concentrated urine caused by excessive sweating.

CARDIOVASCULAR DISTURBANCES: Looney and Hoskins[11] in their series of 10 patients found no change in blood pressure or pulse rate. Rosenblum[68] believes that the drug does not harm the circulatory apparatus. He gave therapeutic doses of dinitrophenol to 25 patients, and noted no effect on blood velocity or pulse rate. Stockton and Cutting[69] carried out the same experiment on 13 patients and discovered no significant changes in vital capacity or in blood pressure but there was both increased pulse rate and venous pressure in 10 patients. These changes continued throughout the time of medication and were at their height during the period of peripheral vasodilatation caused by the drug. To date 10 instances of circulatory change have been reported in patients who were taking dinitrophenol in therapeutic amounts[12,23,70]. Leutsker[70] reports the history of a man who took 3.3 grams of dinitrophenol in 10 days under the direction of a physician. At the end of that time the patient suddenly collapsed. His blood pressure was 70/30, the radial pulse not palpable. He was treated successfully with adrenalin chloride and caffeine sodium benzoate. Masserman and Goldsmith's case[12] was fatal. The blood pressure dropped as low as 36/0 before death. Three of MacBryde and Taussig's patients[22] showed electrocardiographic changes after dinitrophenol. In one case there was marked increase in the size of the T wave in the first two leads, an inversion of the T wave in lead 3, and a

depression of the ST interval in lead 2. The second patient showed an increase in the size of the T waves, depression of the ST interval and moderate notching of the QRS complex in all leads. In the third case there was marked inversion of the T wave in lead 3 and left axis deviation developed. These changes lasted in one case two weeks after dinitrophenol had been withdrawn.

Miscellaneous Disturbances: There have been three cases of ear complications reported.[17,71,72] In Dintenfass'[71] patient there was pain and a sensation of fullness in both ears, accompanied by impairment of hearing. The symptoms disappeared when dinitrophenol was withdrawn and reappeared when medication was resumed. Physical examination revealed bulging and reddening of the ear drums, and there was 30% diminution in hearing. The condition was thought to be due to inflammation and congestion of the pharynx and eustachean tubes. Lung changes have also been reported. Imerman and Imerman's case[57] of agranulocytosis developed a lung abscess. In the postmortems following acute poisoning Tainter and Wood[63], and Poole and Haining[64] reported congestion and edema of the lungs. Noun[72] described a case of asthma in which dinitrophenol brought on attacks. MacBryde[22,23] reported a decrease of sugar tolerance in nine out of 12 patients. Masserman and Goldsmith[12] reported acidosis in their case of circulatory failure after dinitrophenol. Epstein and Rosenblum[14] observed an abortion after ingestion of the drug. This might have been a coincidence, but it is of interest that out of 101 women working with dinitrophenol or related substances in a munitions factory, 13 had miscarriages and only four could be explained on other grounds.

Acute Poisoning: Six cases of acute dinitrophenol poisoning[54,63,64,67,73,74] with four fatalities have been reported. Two of the patients[63,74] took large single doses (4.5 gm.) with the intent of committing suicide, but the other four[54,64,67,73] took so-called therapeutic amounts (0.090 in one case; 0.1 in one case; an amount not definitely stated in one case; and in the fourth case, 0.5 gm. per day, which is somewhat above the usually recommended dosage). Goldman and Haber's case[54] showed symptoms of acute poisoning and agranulocytosis. The other four cases were typical of dinitrophenol poisoning and presented such symptoms as have been described by Tainter[75]. There were nausea and gastrointestinal disturbances, intense sweating, fever as high as 106°F., thirst, restlessness, flushed skin, rapid and deep respiration, dehydration, increased basal metabolic rate (in Eichert's case[73] it rose to +171), and euphoria. Tainter and Wood[63] have also given a complete description of the necropsy in one such case. The temperature had risen to 115°F. 20 minutes after death. Rigor mortis was complete in 10 minutes. The skin was tinged with yellow. There were some fibrous adhesions in the left pleural cavity. The pericardial sac contained only a few cubic centimeters of fluid, and there were a few small ecchymotic hemorrhages in both the visceral and parietal layers of the pericardium. The lungs showed marked congestion and moderate pulmonary edema, the bronchi were congested and contained a small amount of bloody mucus. The peribronchial lymph nodes were small and anthracotic. The spleen was normal except for a few fibrous adhesions over the convexity. The peri-pelvic fat of the kidneys was slightly increased. The liver had a slight but definite icteric tint, and on cut section showed a moderate amount of congestion. On microscopic study there was noted transverse fragmentation of the muscle fibers of the heart. Further microscopic study showed moderate congestion of the liver and a slight fatty infiltration in the periphery of the lobules. The lungs were extremely congested and markedly edematous. The kidneys were also moderately congested.

Tainter[75] recommends early treatment of the symptoms of acute dinitrophenol poisoning: gastric lavage with potassium permanganate solution (1:1000 or 1:2000); icepacks; oxygen tent; 6% dextrose solution intravenously; caffeine or digitan hypodermically.

It can be readily seen from these brief summaries that many disastrous results have followed dinitrophenol ingestion. There has been a total of 281 cases of one or another form of intoxication reported to date.

Experimental Work on Dinitrophenol

NO ATTEMPT will be made here to review completely all of the experimental work on dinitrophenol. The intent is merely to summarize the work which is chiefly of medical rather than pharmacological or chemical significance.

Schulte and Tainter[76] studied the effect of dinitrophenol on renal function. They gave rabbits both fatal and non-fatal daily subcutaneous injections of dinitrophenol for as long as 77 days. Quantitative counts of the urine sediment (Addis method) and the phenolsulphonphthalein excretion test showed that the dinitrophenol had no ill effect on the kidneys. Pugsley[77] also studied the effect of dinitrophenol on excretion. He fed rats 25 mg. daily for 26 days. The basal metabolic rate was high throughout experiment. He found that the dinitrophenol caused a marked creatinuria, and increased amounts of calcium in the feces. Tainter and his associates[78] studied the effect of dinitrophenol on the urine, blood, and tissues of dogs. They gave 5 mg./kg. six days a week to one group and 10 mg./kg. to another for six months, and the dogs remained healthy throughout the period. There were no significant changes in the urine, serum bilirubin, or oxygen capacity of the blood. The hemoglobin, erythrocyte count, and fragility of the red corpuscles were normal, and there were no changes noted in the differential or total leucocyte count. There were no significant changes in organs seen at autopsy or studied microscopically.

Further hematological research was stimulated by the cases of agranulocytosis which developed after the use of dinitrophenol. Climenko studied the effects of dinitrophenol on the peripheral blood picture. Nucleic acid is a known bone-marrow

stimulant, but Climenko found that after he gave rabbits dinitrophenol the leucocytes failed to respond to nucleic acid injections.[80] In another experiment[81] he gave rabbits 20 mg./kg./day of dinitrophenol. After two to five days there was a slight though indefinite leucocytosis which returned to normal in three to five days. After 25 days both the red and white blood cell counts fell sharply. During this experiment, the bone-marrow at first showed myeloid hyperplasia. This hyperplasia continued although later the cells failed to mature. In the last stages the bone-marrow showed focal degeneration and necrosis, and finally aplasia.

Cutting and Tainter[7] investigated the fever producing powers of dinitrophenol in pigeons, rats, rabbits, cats, dogs, and man. They found that 5 to 40 mg./kg. of the drug caused a temperature as high as 40°C. in one-half to four hours. There was a marked increase of rate and depth of respirations which was not accompanied by acidosis. Halpern and Hendryson[79] experimented with the effect of dinitrophenol on the pituitary-gonadal complex in rats, and discovered that the drug did not affect its function.

Although the exact effect of dinitrophenol on animals is interesting, it has more theoretical than practical value. Animals apparently do not respond to the drug in the same manner as humans. Cogan and Cogan[32] were unable to reproduce cataracts in rabbits. Cutting and Tainter[7] found no acidosis occurring in animals. Schulte, Tainter and others[76,78] found that dinitrophenol did not affect the excretion of urine or renal function in rabbits. Cutting, Mehrtens, and Tainter[9] reported that sublethal doses of the drug in dogs did not injure any organ. Tainter and his associates[78] found that the drug had no effect on the peripheral blood picture in dogs.

Attempts to estimate the lethal dose have been made in animals. Anderson, Reed, and Emerson[28] experimented with rats and found that 50% of them died if they were given 40 mg./kg., in one injection, and all died following 50 mg./kg. of dinitrophenol. This confirms earlier work on the subject. In 1919 Perkins[3] summarized the work of Mayer. He found that doses between 30 and 100 mg./kg. were fatal for experimental animals. Koelsch[28] in 1927, also found 50 mg./kg. to be lethal whereas 20-30 mg./kg. is tolerated. Chamberlin[83] has done interesting work on dosage and sex susceptibility. He gave lethal doses to anesthetized casts. Males lived for an average time of 226 minutes, and the females lived only 61 minutes. He ascribes this difference in the sexes to the fact that males have a greater capacity to deliver oxygen to the tissues.

Cutting, Mehrtens, and Tainter[9] placed the therapeutic dose between 3 and 5 mg./kg./day which is enough to raise the basal metabolic rate 20% to 30%; 10 mg./kg. raised oxygen consumption as much as 537% in dogs.[94]

Since dinitrophenol is a known poison, Tainter and Cutting[84] have attempted to discover an antidote. In their experiments they found that arterenol, sodium gluconate plus insulin, monoiodoacetic acid, quinine, and salicylates were completely ineffective. Physiological salt solution given intravenously and cool tepid baths they feel are to be recommended to combat the intense body heat.

Little has been done to determine the therapeutic value of dinitrophenol other than its use as a metabolic stimulant in the treatment of obesity, which has been dealt with in another section of this paper. Since dinitrophenol is a known respiratory stimulant its use has been advocated in the treatment of drug poisoning by morphine, chloral, alcohol, or barbital. Tainter and Cutting[84] found that although respirations were improved in experimental animals, death was not prevented if a fatal dose of an hyponotic had been given. Dinitrophenol has been recommended in treatment of cancer. Vannfält[86] found that 10 mg./kg./day did not prevent the development of tar cancer in mice. Emge, Wulff, and Tainter[85] implanted fibrosarcomas in white mice; if the injection of dinitrophenol was delayed the tumor growth was not inhibited.

Although the response of animal tissues to dinitrophenol is not always the same as that found in man, this work has afforded a general idea of the actions of the drug. The lethal and so-called therapeutic doses have been determined. The use of dinitrophenol as an antidote for depressant drugs and as an agent in the treatment of cancer, have been investigated.

Theoretical Questions

VARIOUS question have arisen in reference to the mechanism of dinitrophenol intoxication. Is the response an allergic phenomenon or is it due to the cumulative toxic properties of the drug? Frumess[24] had a patient who developed urticaria and Quincke's edema after dinitrophenol, and he was able to demonstrate a positive skin test and a positive Prausnitz-Küstner reaction. Beinhauer,[16] in a case of urticaria following dinitrophenol, was able to produce a mildly positive scratch test. Noun's patient was asthmatic and showed positive skin tests for orange, tomato, cat hair, goose feathers. Dinitrophenol brought on attacks, and the Prausnitz-Küstner test produced skin reactions as well as mild asthma. Perkins[3] in her report on the use of dinitrophenol in the munitions industry, states that employees working under exactly the same conditions show different degrees of susceptibility. Dameshek and Gargill[52] also feel that individuals show varying types of reaction to the drug. Climenko[81] feels, on the basis of his animal studies that the agranulocytic response is semi-toxic, semi-allergic with the granulocytes in the peripheral blood acting as the shock organ. The dyscrasia, he thinks, is probably not due to dinitrophenol itself but to some conjugation or oxidation product of the drug. However, the limit of tolerance is fairly regular in animals.

Matzger[20] tried skin tests by scratch, patch, and intradermal methods in 157 individuals who had never received dinitrophenol. The results were negative. However, three of these patients developed toxic skin lesions after dinitrophenol medi-

cation. Passive transfer was attempted after one of the patients developed a severe reaction, and was negative. The Prausnitz-Küstner reaction was also negative in Hitch and Schwartz's case[17] of dermatitis exfoliativa. Tainter *et al.*[4] performed skin tests on patients with and without toxic skin manifestations but were unable to demonstrate sensitivity by patch, scratch, intradermal wheal, or passive transfer tests. The underlying factor in cases of agranulocytosis, they believe is a defective bone marrow, and that dinitrophenol merely initiates the syndrome as might some other bacterial, chemical, or physical agent.[4] It is difficult to answer the question on the basis of the evidence presented. The reports of the skin tests are conflicting, and the question must remain open for further investigation.

Nadler feels that individuals sensitive to dinitrophenol react to repeated exposures to small amounts and that true cumulative action does not underly the poisoning. Perkins[3] describes various animal experiments which show that tolerance to a lethal dose may be built up by a series of non-fatal doses. Lethal amounts may then be given for as long as a month and a half. This would indicate, the author says, that a definite concentration must be given in a single dose in order to be fatal. On the other hand, certain susceptible animals die after a series of non-lethal doses. Further arguments in favor of the cumulative effect of dinitrophenol have been presented. Eichert[73] reported a case of acute poisoning which occurred a year and a half after the patient had first begun taking the drug. He believed that this was a cumulative result since the patient had taken dinitrophenol so long with no ill effects.

Discussion

MANY, varied, and unexpected effects have resulted from the use of dinitrophenol. Disturbances of the skin, eyes, ears, lungs, heart, liver, kidneys, nerves, blood, have occurred after use of the drug. The majority of these cases have resulted after taking dinitrophenol within the so-called therapeutic limits. Even though these might be instances of individual susceptibility, there is no way of predicting this intolerance. Skin tests have shown conflicting results. The Derrien reaction for urinalysis[3] merely shows dinitrophenol absorption and excretion. Cases which have been carefully followed have suddenly developed serious reactions.[52,70,73] Even though frequent blood counts are taken the patient may unexpectedly develop agranulocytosis without showing warning signs in the peripheral blood picture.[52] Again, the patient may take the drug over a long period of time, and then suddenly become the victim of acute poisoning.[73]

The toxic potentialities of the drug were early recognized. Even before cases of agranulocytosis or liver damage had been reported, Quick[87] pointed out the possibility of their occurrence, and Beckman[88] warned against the use of the agent until further careful study had been made. When the drug first came on the market as a treatment for obesity, many industrial plants in which dinitrophenol was used (e.g. manufacture of munitions, dyes, and wood preservatives) sent notices to all their employees warning them against the use of dinitrophenol as a drug. One industrial physician writes: "We were nothing short of amazed some time ago when the medical profession recommended this compound for the treatment of obesity and some of the results experienced were well within our expectations. We treat the material with a great deal of respect and, in all probability, for this reason we have escaped the disastrous results which may so readily occur."[89]

Canada has considered changing her Food and Drug Act in order to bar the sale of dinitrophenol.[90] Physicians in England have recommended that all nitrophenols be added to the poisons list.[91] In spite of many cases of dinitrophenol intolerance reported in this country, little has been done to curb its use. Many physicians still recommend it. It is probably contained in more than the 34 patent or proprietary medicines[92] which are listed below:

aldinol	dinitrose
alpha dinitrophenol	formula 281
corpu-lean	formula 761
dekrysil	nitraphen
dilex-redusols	nitrobese
dinitrenal	nitromet
dinitriso	nitrophen
dinitrol	nox-ben-ol
dinitrolac	prescription No. 17
dinitrole	re-du
dinitronal	redusols
dinitrophenol	S. & C. dinitrophenol
dinitropheno-Searle	slim
dinitrophenol-alpha (pure)	sodinal
dinitrophenol compound	tabolin
dinitrophenol-sodium	techni dinitrophen
dinitrophes	thyo-nitrol

These can be bought in many drug stores. Suicide with the drug has been reported,[63,74] and yet it is an over-the-counter obesity remedy. Unlike many poisons which are not toxic if taken in sufficiently small amounts, dinitrophenol may cause damage even though taken in the usually recommended quantities.

Conclusion

DINITROPHENOL should be looked upon as an extremely dangerous drug for the reason that there is no test for susceptibility to its severe toxic effects and that, therefore, the occurrence of such reactions as described in this paper is unpredictable. The authors feel that the medical profession should discontinue the use of this agent.

[NOTE: We wish to express our appreciation to Dr. Harry Beckman, Professor of Pharmacology at Marquette Medical School for the helpful advice he has given in preparation of this paper.]

Bibliography:

1. CAZENEUVE, P., and LEPINE, R.: Sur les Effets Produits par l'ingestion et l'infusion Intraveneuse de Trois Colorants Jaunes Dérivés de la Houille, *Compt. rend Acad. d, sc.*, 101:1167, 1885.

2. GIBBS, W., and REICHERT, E. T.: A Systematic Study of the Action of Definitely Related Chemical Compounds upon Animals, *Am. Chem. J.*, 13:289, 1891.

3. PERKINS, R. G.: A Study of Munitions Intoxications in France, *Pub. Health Rep.*, 34:2335, 1919.

4. TAINTER, M. L., CUTTING, W. C., and STOCKTON, A. B.: Use of Dinitrophenol in Nutritional Disorders, *Am. J. Pub. Health*, 24:1045, 1934.

5. Rabinowitch, I. M., and Fowler, A. F.: Dinitrophenol, *Canad. M. A. J.*, 30:128, 1934.

6. Magne, H., Mayer, A., and Plantefol, L.: Action Pharmacodynamique des Phénols nitrés, *Ann. de Physiol.*, 8:1, 1932.

7. Cutting, W. C., and Tainter, M. L.: Actions of Dinitrophenol, *Proc. Soc. Exper. Biol. & Med.*, 29:1268, 1932.

8. Editorial: Dinitrophenol and Accelerated Tissue Metabolism, *J.A.M.A.*, 101:2122, 1933.

9. Cutting, W. C., Mehrtens, H. G., and Tainter, M. L.: Actions and Uses of Dinitrophenol Promising Metabolic Applications, *J.A.M.A.*, 101:193, 1933.

10. Tainter, M. L., Stockton, A. B., and Cutting, W. C.: Dinitrophenol in the Treatment of Obesity, *J.A.M.A.*, 105: 332, 1935.

11. Looney, J. M., and Hoskins, R. G.: The Effect of Dinitrophenol on the Metabolism as seen in Schizophrenic Patients, *New England J. Med.*, 210:1206, 1934.

12. Masserman, J. H., and Goldsmith, H.: Dinitrophenol: Its Therapeutic and Toxic Actions in Certain Types of Psychobiologic Underactivity, *J.A.M.A.*, 102:523, 1934.

13. Handovsky, H.: Mechanism and Therapeutic Significance of Metabolism Increasing Actions of Dinitrophenol Derivatives, *Wien. klin. Wchnschr.*, 49:1301, 1936.

14. Epstein, E., and Rosenblum, H.: Peripheral Neuritis and Abortion Following Dinitrophenol Therapy: Case, *J. Lab. & Clin. Med.*, 20:1118, 1935.

15. Tainter, M. L., Stockton, A. B., and Cutting, W. C.: Use of Dinitrophenol in Obesity and Related Conditions, *J.A.M.A.*, 101:1472, 1933.

16. Beinhauer, L. G.: Urticaria Following Use of Dinitrophenol, *West Virginia M. J.*, 30:466, 1934.

17. Witch, J. M., and Schwartz, W. F.: Late Toxic Results, Including Dermatitis Exfoliativa, from "Slim" (Dinitrophenol), *J.A.M.A.*, 106:2130, 1936.

18. Swett, W. F.: Eye Complications Following Use of Reducing Agents, *Am. J. Ophth.*, 19:796, 1936.

19. Jackson, H., and Duvall, A.: Dinitrophenol Poisoning, *J.A.M.A.*, 102:1844, 1934.

20. Matzger, E.: Can Sensitivity to Dinitrophenol be Determined by Skin Test? *J.A.M.A.*, 103:253, 1934.

21. Rundles, W. Z.: Dinitrophenol Catarat: Case History, *J. Michigan M. Soc.*, 34:777, 1935.

22. MacBryde, C. M., and Taussig, B. L.: Functional Changes in Liver, Heart, and Muscles and Loss of Dextrose Tolerance Resulting from Dinitrophenol, *J.A.M.A.*, 105: 13, 1935.

23. MacBryde, C. M.: Toxicity of Dinitrophenol, *J. Missouri M. A.*, 33:99, 1936.

24. Frumess, G. M.: Allergic Reactions to Dinitrophenol, *J.A.M.A.*, 102:1219, 1934.

25. Hirsch, S.: Report of a Toxic Manifestation Due to "Dinitrenal", *J.A.M.A.*, 102:950, 1934.

26. Gimsing, T.: Toxic Exanthem after Administration of Dinitrophenol: Case, *Ugesk. f. laeger*, 96:527, 1934.

27. Noun, M. H.: Urticaria, Edema, and Purpura Following Small Doses of Dinitrophenol: Case, *Arch. Dermat. & Syph.*, 32:288, 1935.

28. Anderson, H. H., Reed, A. C., and Emerson, G. A.: Toxicity of Dinitrophenol: Case, *J.A.M.A.*, 101:1053, 1933.

29. Beebe, N. L.: Dinitrophenol Poisoning, *Colorado Med.*, 32:30, 1935.

30. Horner, W. D.: Cataract following Dinitrophenol Treatment for Obesity, *Arch. Ophth.*, 16:447, 1936.

31. Rodin, F. H.: Cataracts Following Use of Dinitrophenol: Summary of Thirty-two Cases, *California & West. Med.*, 44:276, 1936.

32. Cogan, D. G., and Cogan, F. C.: Cataracts and Dinitrophenol, *New England J. Med.*, 213:854, 1935.

33. Barkan, H., Borley, W. E., Fine, M., and Bettman, J.: Operative Results in Cataracts Coincident with Dinitrophenol Therapy, *California & West. Med.*, 44:360, 1936.

34. Boardman, W. W.: Rapidly Developing Cataract after Dinitrophenol, *California & West. Med.*, 43:118, 1935.

35. Josephson, E. N.: Ascorbic (Cevitamic) Acid in Dinitrophenol Cataracts, *Science*, 82:222, 1935.

36. Hill, H. E.: Cataract Formation Occurring Following Use of Dinitrophenol, *J. Indiana M. A.*, 29:67, 1936.

37. Horner, W. D., Jones, R. B., and Boardman, W. W.: Cataracts following Dinitrophenol; Preliminary Report of Three Cases, *J.A.M.A.*, 105:108, 1935.

38. Rank, R. T., and Waldeck, E. A.: Cataract; Development of Following Use of Dinitrophenol, *Wisconsin M. J.*, 35:629, 1936.

39. Boardman, W. W.: Rapidly Developing Cataract after Dinitrophenol, *Ann. Int. Med.*, 9:195, 1935.

40. Boardman, W. W.: Rapidly Developing Cataract after Dinitrophenol, *J.A.M.A.*, 105:108, 1935.

41. Allen, T. D., and Benson, V. M.: Late Development of Cataract Following Use of Dinitrophenol about a Year Before, *J.A.M.A.*, 105:795, 1935.

42. Kniskern, P. W.: Cataracts Following Dinitrophenol, *J.A.M.A.*, 105:794, 1935.

43. Lazar, N. K.: Cataract Following Use of Dinitrophenol, *J.A.M.A.*, 105:794, 1935.

44. Veasey, C. A.: Cataract Following Use of Dinitrophenol: Two Cases, *Am. J. Ophth.*, 19:332, 1936.

45. Spaeth, E. B.: Dinitrophenol Cataracts with Signs of Tetany, *Am. J. Ophth.*, 19:320, 1936.

46. Mann, W. A.: Cataract due of Dinitrophenol, *Arch. Ophth.*, 15:116, 1936.

47. Cogan, D. G., and Cogan, F. C.: Dinitrophenol Cataract, *J.A.M.A.*, 105:793, 1935.

48. Vav der Hoeve, J., and Daniels, A. P.: Cataract due to Ingestion of Alpha-dinitrophenol, *Nederl. tijdschr. v. geneesk.*, 80:126, 1936.

49. Hessing, E. E.: Cataract due to Dinitrophenol: Report of Cases, *Arch. Ophth.*, 17:512, 1937.

50. Whalman, H. F.: Dinitrophenol Cataract, *Am. J. Ophth.*, 19:885, 1936.

51. Silver, S.: New Danger in Dinitrophenol Therapy; Agranulocytosis with Fatal Outcome, *J.A.M.A.*, 103:1058, 1934.

52. Dameshek, W., and Gargill, S. L.: Report of Two Cases of Agranulocytosis Following the Use of Dinitrophenol, *New England J. Med.*, 211:440, 1934.

53. Davidson, E. N., and Shapiro, M.: Neutropenia Following Dinitrophenol with Improvement after Pentnucleotide and Leucocyte Cream, *J.A.M.A.*, 103:480, 1934.

54. Goldman, A., and Haber, M.: Acute Complete Granulopenia with Death Due to Dinitrophenol Poisoning, *J.A.M.A.*, 107:2115, 1936.

55. Hoffman, A. M., Butt, E. M., and Hickey, N. G.: Neutropenia Following Amidopyrine, *J.A.M.A.*, 102:1213, 1934.

56. Bohn, S. S.: Agranulocytic Angina Following Ingestion of Dinitrophenol, *J.A.M.A.*, 103:249, 1934.

57. Imerman, S. W., and Imerman, C. P.: Dinitrophenol Poisoning with Thrombocytopenia, Granulopenia, Anemia, and Purpura Complicated by Lung Abscess, *J.A.M.A.*, 106:1085, 1936.

58. Krack, R. R., and Parker, F. P.: The Etiology of Granulopenia (Agranulocytosis), *J. Lab. & Clin. Med.*, 19:799, 1934.

59. Nadler, J. E.: Peripheral Neuritis Caused by Prolonged Use of Dinitrophenol, *J.A.M.A.*, 105:12, 1935.

60. Van Bogaert, L.: Deux Cas de Nevrite, dont l'un avec Dysgueusie, dus à l'A-dinitrophénol, *Bull. et mém. Soc. Méd. d. hôp. de Paris*, 51:1393, 1935.

61. Shutes, M. H.: Dinitrophenol (as cause of cataract), *Am. J. Ophth.*, 18:752, 1935.

62. de Chatel, A., and Motika, J.: Uber die Gefahren der Therapeutischen Anwedung des Alpha-Dinitrophenols, *Deutsches Arch. f. klin. Med.*, 176:700, 1934.

63. Tainter, M. L., and Wood, D. A.: A Case of Fatal Dinitrophenol Poisoning, *J.A.M.A.*, 102:1147, 1934.

64. Poole, F. E., and Haining, R. B.: Sudden Death from Dinitrophenol Poisoning, *J.A.M.A.*, 102:1141, 1934.

65. Sidel, N.: Dinitrophenol Poisoning Causing Jaundice: Report of a Case, *J.A.M.A.*, 103:254, 1934.

66. Haft, H. H.: Toxicity of Dinitrophenol, *J.A.M.A.*, 101:1171, 1933.

67. Lattimore, J. L.: Dinitrophenol Poisoning, *J. Kansas M. Soc.*, 35:388, 1934.

68. Rosenblum, H.: Rate of Blood Flow in Patients Receiving Dinitrophenol, *J.A.M.A.*, 104:1592, 1935.

69. Stockton, A. B., and Cutting, W. C.: Clinical Circulatory Effects of Dinitrophenol, *J.A.M.A.*, 103:912, 1934.

70. Leutsker, R. J.: Instance of Circulatory Collapse Attributed to Dinitrophenol, *U. S. Nav. M. Bull.*, 33:394, 1935.

71. Dintenfass, H.: An Ear Complication From Dinitrophenol Medication, *J.A.M.A.*, 102:838, 1934.

72. Noun, M. H.: Asthma From Dinitrophenol Sensitization (case), *J. Iowa M. Soc.*, 25:610, 1935.

73. Eichert, H.: An Unusual Case of Dinitrophenol Poisoning, *Bull. Johns Hopkins Hosp.*, 58:378, 1936.

74. Purvine, R.: Fatal Poisoning from Sodium Dinitrophenol, *J.A.M.A.*, 107:2046, 1936.

75. Tainter, M. L.: Treatment of Acute Dinitrophenol Poisoning, *J.A.M.A.*, 104:1071, 1935.

76. Schulte, L. L., and Tainter, M. L.: Chronic Toxicity of Dinitrophenol: Renal Function, *Proc. Soc. Exper. Biol. & Med.*, 31:1163, 1934.

77. Pugsley, L. I.: The Effect of 2:4 Dinitrophenol upon Calcium, Creatine, and Creatinine Excretion in the Rat, *Biochem. J.*, 29:2247, 1935.

78. TAINTER, M. L., CUTTING, W. C., WOOD, D. A., and PROESCHER, F.: Dinitrophenol; Studies of Blood, Urine, and Tissues of Dogs on Cintinued Medication, *Arch. Path.*, 18:881, 1934.

79. HALPERN, S. R., and HENDRYSON, I. E.: Comparative Effects of Dinitrophenol and Thyroid on Pituitary-Gonadal Complex of Female Rats, *Proc. Soc. Exper. Biol. & Med.*, 33:263, 1935.

80. CLIMENKO, D. R.: Inhibition of Leucogenic Activity in Rabbit by Certain Cyclic Compounds, *Proc. Soc. Exper. Biol. & Med.*, 32:823, 1935.

81. CLIMENKO, D. R.: The Modification of the Hematopoietic Function in Rabbits, *J. Lab. & Clin. Med.*, 21:913, 1936.

82. CUTTING, W. C., and TAINTER, M. L.: Metabolic Actions of Dintrophenol with Use of Balanced and Unbalanced Diet, *J.A.M.A.*, 101:2099, 1933.

83. CHAMBERLIN, P. E., and HALL, V. E.: Sex Difference in Susceptibility of Dinitrophenol Intoxication in Anesthetized Cats, *Proc. Soc. Exper. Biol. & Med.*, 34:385, 1936.

84. TAINTER, M. L., and CUTTING, W. C.: Miscellaneous Actions of Dinitrophenol, Repeated Administrations, Antidotes, Fatal Doses, Antiseptic Tests and Actions of Some Isomers, *J. Pharm. & Exper. Therap.*, 49:187, 1933.

85. EMGE, L. A., WULFF, L. M. R., and TAINTER, M. L.: Effects of Dinitrophenol on Experimental Sarcoma of White Rat, *Proc. Soc. Exper. Biol. & Med.*, 31:152, 1933.

86. VANNFALT, K. A.: Influence of 1-2-4-Dinitrophenol on Tar Cancer in White Mice, *Upsala läkaref. förh.*, 42:55. 1936.

87. QUICK, A. J.: Dangerous Drug Reactions, *J.A.M.A.*, 102:1419, 1934.

88. BECKMAN, H.: Treatment in General Practice, p. 395. Philadelphia and London, W. B. Saunders Company, 1934.

89. GEHRMANN, G. H.: Personal Communication, November, 1936.

90. Medical News: Bar Sale of Dinitrophenol (in Canada), *J.A.M.A.*, 103:1243, 1934.

91. Medicine and the Law: Dekrysil Treatment; the Paddington Inquest, *Lancet*, 1:652, 1934.

92. American Medical Association, Council on Pharmacy and Chemistry: Personal Communication, May, 1936

93. HUNT, W. D.: Dinitrophenol: Clinical Experiences. *Northwest. Med.*, 33:209, 1934.

94. HALL, V. E., FIELD, J., SAHYUN, M., CUTTING, W. C., and TAINTER, M. L.: Carbohydrate Metabolism, Respiration and Circulation in Animals with Basal Metabolism Heightened by Dinitrophenol, *Am. J. Physiol.*, 106:432, 1933.

Industrial Medicine and Compensation in Mexico

LEOPOLD BRAHDY, B.S., M.D.,
New York City

MEXICO, with a population of 17 millions, is predominantly an agricultural country with less than 20% of its workers engaged in industry.* Its large scale industries are mining, oil production, and transportation. Most of its manufactured commodities are made in small plants, where work is leisurely and individualistic, for mass production is still in its infancy. Many of the workers come from the farms and so have only recently acquired industrial skill. The cost of living in Mexico is lower than in the United States, but wages, with rare exceptions, are proportionately still lower. These factors, together with other aspects of Mexican life, must be kept in mind when we consider the status of industrial medicine and workmen's compensation in Mexico.

In Mexico, the Federal compensation law applies to the great majority of workers, while the laws of the states cover very few. In the United States, on the contrary, the Federal law applies to only a few occupations, the bulk of our workers being under the jurisdiction of the laws of the states in which they are employed. Our state laws vary greatly. Some cover only a small number of employees and give but meager benefits whereas others, particularly in the more industrially advanced states, provide for more extensive coverage and more liberal rates. The Workmen's Compensation law of New York State belongs to this latter group. The standards established by the Mexican Compensation law, should be judged not according to those in New York State but rather in comparison with the standards set up in one of our agricultural states. However, as it is not my intention to judge but to review, I compare Mexican practice with that which I know best, namely, that of New York.

The Mexican Workmen's Compensation Law requires that the employer provide treatment and pay disability benefits for all injuries and all diseases attributable to the occupation. In death cases, provisions are also made for funeral expenses and payments to dependents. If there are no dependents, only funeral expenses need be paid, whereas our own procedure in such cases requires that payments be made into special funds used for rehabilitation training, for research and for payment of benefits in certain types of disability unrelated to the injury. In Mexico total death benefits payable to dependents may not exceed 102 weeks' full pay. This is, of course, much less than our provision for payment of 30% for life to the widow in addition to sums for dependent children and other dependents.

The Mexican law requires that an autopsy be performed in all cases where it is believed that death may have resulted from an industrial accident or disease. Due to the active assistance of the labor unions, consent to postmortem examinations is readily obtained. These examinations are usually performed by District Medical Examiners who, in addition to reports, send parts of the diseased organs, properly sealed, to the Labor Department in Mexico City for further histological study. This system of using a central laboratory insures uniform standards and makes quickly available for the entire country data accumulated from any one locality. It is, therefore, an important factor in advancing the prevention and treatment of industrial disease.

Payments to Employees

DURING the period of temporary disability, technically called the healing period, the injured employee receives three-fourths of his wages with a maximum of $16.00 a week. Such payments continue until complete recovery or until the condition is permanent, but they do not extend beyond a period of one year. Any time within that year either the employer or employee may request a determination as to whether the injured has recovered or has been left with a permanent handicap. If he is found to be perma-

* Read at the Annual Meeting of the Association for Advancement of Industrial Medicine and Surgery, New York, December 15, 1937.

nently and totally disabled, he is entitled to an additional final award of 156 weeks' full pay. If he has an earning capacity but a permanent defect, that is, any permanent *partial* disability, the employee is entitled to compensation benefits in addition to those paid to him during the healing period. An award for disability of this character is governed by an extensive schedule wherein a percentage of the 156 weeks allowed for total disability is fixed for each lesion. This schedule contains 242 classifications. I was told that the number of classifications will be increased. If there are two or more injured parts, the award may not exceed the amount for total disability. As the schedule attempts to classify all disabilities, we may call it the complete schedule system. To illustrate, the schedules for the upper limb and for the face are shown in Tables I and II.

TABLE I
COMPENSATION SCHEDULE FOR UPPER EXTREMITY

1. Disarticulation at the shoulder	65 to 80%
2. For loss of an arm between the elbow and the shoulder	60 to 75%
3. Disarticulation at the elbow	55 to 70%
4. For loss of the forearm between wrist and elbow	50 to 65%
5. For total loss of a hand	50 to 65%
6. For loss of four digits of the hand, including the thumb and the corresponding metacarpal bones, even though the loss of these is partial	50 to 60%
7. For loss of four digits of one hand excluding the thumb	40 to 50%
8. For loss of the thumb with its metacarpal	20 to 30%
9. For loss of the thumb only	15 to 20%
10. For loss of the distal phalanx of the thumb	10%
11. For loss of index finger with its metacarpal or part of it	10 to 15%
12. For loss of one index finger	8 to 12%
13. For loss of the distal phalanx with mutilation or loss of second phalanx of index finger	6%
14. For loss of middle finger with mutilation or loss of its metacarpal or part of it	8%
15. For loss of one middle finger	6%
16. For loss of distal phalanx with mutilation of second phalanx of middle finger	4%
17. For loss of distal phalanx of middle finge	1%
18. For loss of ring or of little finger, with mutilation or loss of its metacarpal, or part of it	7%
19. For loss of ring finger with deformity of little finger	5%
20. For loss of distal phalanx with deformity of middle phalanx of ring or little finger	3%
21. For loss of distal phalanx of ring or little finger	1%
If the injured limb is the less useful of the two the indemnity shall be 15% less than stated in this schedule.	

The government physician fixes the "schedule" or percentage loss between the higher and lower percentages, giving due consideration to the following factors: the nature and extent of the lesion, whether it disables the employee from his usual occupation, the age of the employee, whether he has been furnished with artificial limbs or other orthopedic aids and whether the employer has provided him with any rehabilitation training. The law lists 40 industrial diseases, but any industrial disease comes within the law. The benefits payable for total disability due to an industrial disease are similar to those paid for injury. Payments for partial disability follow a similar schedule system. For example, if there is a permanent lesion, such as the pulmonary fibrosis of silicosis, a percentage of disability is established and that percentage of 156 weeks' full pay is awarded to the worker.

Payments for permanent partial disability are made regardless of whether the worker earns the same salary as he did before injury.

Payments after the healing period are made in one lump sum. This has been found unsatisfactory, confirming our own experience with large lump sum payments. I have been told by Dr. E. Gonzalez Ancira, Chief Physician of the Labor Department, that he will soon recommend to the Mexican Congress that payments in installments be authorized. He will also recommend an increase in the benefits for permanent total disability.

TABLE II
COMPENSATION SCHEDULE FOR FACE INJURIES

159. For mutilations which include both superior maxillae and the nose, depending on the loss of substance of the soft-parts	80 to 90%
160. Upper jaw, mal-union and mastication impossible	40 to 50%
161. Where mastication is possible but limited	10 to 20%
162. In case of prosthesis with improved mastication	0 to 10%
163. Loss of substance of upper palate according to location and extent and in case of prosthesis, with decided functional improvement	5 to 25%
164. Lower jaw mal-union with or without loss of substance (after surgical treatment has failed) when it causes impairment of mastication	40 to 50%
165. With good union of the ascending ramus	1 to 5%
166. With mal-union of the ascending ramus	10 to 15%
167. With fair union of the horizontal ramus	5 to 10%
168. With mal-union of the horizontal ramus	15 to25%
169. Good union at the symphysis	10 to 15%
170. Mal-union at the symphysis	15 to 25%
171. In case of prosthesis, producing decided functional impairment	10% less
172. Mal-unions, when articulation of the teeth is such as to limit mastication	10 to 20%
173. When articulation is fairly good	0 to 10%
174. When mastication is improved by an artificial apparatus	0 to 5%
175. For loss of a tooth	Replacement
176. For loss of all the teeth	10 to 20%
177. Where cicatrical tissue limits opening the mouth with resulting poor oral hygiene or mastication or with escape of saliva or defect in speech	10 to 20%
178. Irreducible dislocation of the temperomaxillary joint according to degree of functional impairment	10 to 25%
179. Partial or total amputations of the tongue with adhesions, according to the impairment of speech and deglutition	10 to 30%

The New York law requires the payment of two-thirds of the wages for the full period of total disability even if it be for life. In most cases when the worker earns the same salary as before injury, no further payment is due. In New York, the schedule system is used only for loss of or permanent defects in the upper or lower extremity or vision or total loss of hearing in one or both ears. When there is a permanent loss of function of one of these, an award is made in addition to the payments for the healing period regardless of

whether or not the worker is earning his usual salary. If there is a partial loss of an extremity or vision, or a permanent defect in one of these, the percentage is estimated on the basis of an examination by a physician of the State Labor Department. The point is that the percentage is a matter of medical judgment and not of legal definition.

The New York schedule of payments for the upper extremities is shown in Table III. Facial disfigurements are compensated by a method analogous to the schedule system. This system of limiting scheduled payments to a few measurable disabilities we may call the *limited* schedule system. The majority of injuries do not come under any schedule, while under the Mexican system everything is scheduled. Most workers are paid two-thirds of their wages as long as they are totally disabled—or a proportionate amount if the disability is partial. The maximum compensation rate in New York is $25.00 per week, approximately 50% higher than that provided for by the Mexican law.

TABLE III

THE NEW YORK SCHEDULE FOR THE UPPER EXTREMITY

Total loss of arm	208 weeks average salary
Total loss of hand	163 weeks average salary
Total loss of thumb	50 weeks average salary
Total loss of index finger	32 weeks average salary
Total loss of middle finger	20 weeks average salary
Total loss of ring finger	16 weeks average salary
Total loss of small finger	10 weeks average salary

Loss of more than one-half a phalanx is considered the same as loss of one-half digit. The loss of more than one and one-half phalanges is considered the same as total loss of the digit. Compenation is the same for the right as for the left extremity.

The Department of Labor in Mexico is authorized to make such changes in the schedule of disabilities and make such additions to the listed industrial diseases as may be indicated by the extension of medical knowledge. Thus the law keeps pace with changing industrial processes and the ever widening field of industrial medicine. In England the Home Secretary has practically similar powers, but in New York no changes whatsoever may be made except by the State Legislature.

The complete schedule system used in Mexico follows the trend of the French law, which has been adopted in some of our States (California and others). It provides for small payments for minor lesions for which in New York no compensation at all is paid. However, it is usually associated with insufficient payments for serious disability, where the protection of more liberal benefits is most needed.

Perhaps this is counterbalanced by the provisions in the Mexican law aiming at rehabilitation and re-employment of the injured worker. Unlike our compensation laws, if the employee recovers within a year of his injury the employer must reinstate him. If the worker is disabled from his usual work, but there is a job compatible with his working capacity available in his plant, then the employer must engage that worker for that job. It is difficult to estimate the extent to which this provision for re-instatement is carried out. My own observations indicate that the large employers generally adhere to this provision and that smaller firms usually do not have available positions suitable for partially disabled men. It was gratifying to hear that in spite of the provisions for partial disabilities, malingering is rare.

Medical Care

THE injured employee has no free choice of physicians as under the New York law. Medical care is given by physicians selected by the employer. The medical profession and labor organizations have expressed no desire for any other method of providing medical care. There is an exception, sanctioned by usage, for some labor unions which own large modern hospitals for the care of their members in *any* illness. Naturally union members who are injured in the course of employment use their own institutions.

All employers are required to maintain first aid cabinets at the place of work. Occasionally their usefulness in an emergency is limited. At one place I visited where I asked to see the cabinet, we waited fully a half hour before the man entrusted with its only key was found. If there are over 100 employees, a dressing station is required which must be supervised by a physician who visits the plant at regular intervals. Where there are more than 300 workers in an establishment, the employer must arrange for hospital service and transportation to the hospital. If there is no hospital available within a distance of two hours' transportation time from the plant, the employer must establish an infirmary.

Mining and transportation companies are required to train a few of the employees in emergency first aid and these employees are obligated to render such service whenever the occasion may arise.

Accident Prevention

THE Mexican Labor Department has established many safety regulations. In the event of their breach, penalties are fixed for both the employer and the employee. Plant inspections are made by physicians and engineers. In order to insure faithful adherence to these regulations and to further safeguard against accidents or diseases which may be attributable to an individual plant by reason of its peculiar hazards, the law requires the establishment of safety committees in larger plants. These committees represent two groups, half the members being designated by the employer and half elected by the employees. The employees are empowered to have an engineer present at meetings for the purpose of advice and assistance, but this engineer cannot vote on any question presented. Once this committee is appointed, it becomes autonomous. Its duties are to inspect the plant for the purpose of observing that all safety and sanitary regulations are enforced, and, when necessary, to formulate additional rules

as may be needed to promote health and safety.

The employer must carry out all recommendations for structural improvements, safety devices or sanitary measures made by the committee. In the event that the employer fails or refuses to follow such recommendations, the matter is referred for arbitration to the Labor Department whose decision is final. Where an employee is guilty of an infraction of safety rules, the committee may recommend a reprimand or suspension without pay for a period up to eight days. These committees, in some places, function admirably and efficiently, while elsewhere they accomplish little.

In the event of a serious accident, two or more members of the safety committee are called. They often arrive at the scene of the accident immediately after first aid is administered and conduct a thorough investigation of the circumstances at once. The value of immediate investigations for building a system of accident prevention is obvious to every safety engineer.

I had the privilege of being present at the meeting of the Safety Committee of the Mexican Light and Power Company through the courtesy of Ingeniero G. Solis. As there were over 300 employees in this establishment, the committee consisted of eight members. The company's representatives were a physician, an engineer, a lawyer and a plant superintendent, all of whom were in the service of the company; the other four members of the committee were chosen by their fellow employees. Since safety problems in a power plant are highly technical, an electrical engineer was present to advise the workers. Because some of the plants or branches are located at a distance from the city, local sub-committees had been appointed and communications from the sub-committees were read and duly considered. At this particular meeting, one of the problems discussed was the efficacy of various methods and apparatus used for artificial respiration in electric shock and methods of teaching workers their use. I was informed that pursuant to recommendations of this very committee, the company had willingly carried out extensive physical alterations in one of its plants. As the company had always complied with the recommendations of this committee during the three years of its existence, there had been no appeals for arbitration to the Labor Department.

It is apparent that an efficient committee does not spring, Minerva-like, full panoplied from the head of the law. At first there was distrust, disagreement, and nothing was accomplished. In the future, no doubt, more differences and difficulties will arise. However, there is sufficient spirit of cooperation that one may prophesy that these committees will decidedly raise the standards of industrial health and safety.

Pre-Employment and Periodic Examinations

IN ALL industries where there is a serious health hazard, all applicants for employment are examined by the company's physician and if indicated, Wassermann tests are done. Subsequent examinations are made at regular intervals. This program of medical examinations is approved by both employer and employee and is considered one of the most important foundation stones on which to build the health of the industrial population. This is in contrast to the suspicion with which organized labor in the United States regards such medical examinations.

Administration

THE Mexican law does not create a State Insurance Fund, nor is insurance compulsory. Under certain limited circumstances, ship owners must carry workmen's compensation insurance. Most compensation payments are made directly by the employer and the law requires no bond, as is required from self-insurers under the law in New York and other states. To us, it would seem difficult and unsafe to administer workmen's compensation without some insurance scheme. However, it seems that neither the Mexican Department of Labor nor organized labor itself desires any compulsory insurance or even voluntary insurance. This may be due to the fact that even in the most costly cases, such as permanent total disability, the maximum liability of the employer is less than four years' salary, so that the risk of the employer becoming unable to meet his obligation is unusual, thereby making an insurance scheme unnecessary.

The Mexican government has a department unknown to us—"The Office of Public Defender"—which cooperates with the Labor Department. A workman who has been injured or believes he has an industrial disease may appear at this office and have a state attorney assigned to his case. Upon such assignment he is examined by a physician of the Public Defenders' Office who is a full time employee. When the medical reports of the physicians who treated the worker are available, the Public Defender's physician renders his decision. If this decision is not acceptable either to the employer or the employee, an appeal may be taken to the Medical Consulting Office which is an integral part of the Labor Department. Here the patient is either re-examined or the medical records are reviewed by one of the physicians of this office. The physicians have examining rooms equipped with x-ray and clinical laboratories. The worker may, if he prefers, retain his own lawyer. In such a case the Labor Department, in contrast to our procedure, takes no jurisdiction of the amount or method of payment for legal services.

There is a special Division of Occupational Diseases which includes accident prevention. Until quite recently, the functions of this division were divided between the Department of Health and the Department of Labor. Recently 15 physicians doing industrial hygiene work were transferred from the Secretariate of Health to the Department of Labor, so that all the work is now concentrated under Dr. A. Betancourt, Chief of the Occupational Disease Division. Silicosis constitutes one of the main problems now before this division, as mining is one of the major industries of Mexico.

Although the physicians employed by the Department of Labor are permitted to have some private practice, or to teach, they are, for all practical purposes, full time employees. There is nothing comparable to our Civil Service system, so that tenure of office is uncertain, but the present administration has adopted the policy of removing no one from government service unless charges are preferred and substantiated. I am informed that the adoption of a Civil Service system is contemplated.

Education

DURING 1936-37 a series of radio broadcasts explaining the fundamentals of industrial medicine were given under the auspices of the University of Mexico Medical School. Some of these broadcasts were primarily for physicians and others for the workers. The undergraduate medical curriculum is so arranged that the students in their fifth year receive a course of instruction in industrial medicine and surgery. The course is given by Dr. U. Roldan for six months, three hours a week. It consists of lectures, attendance at clinics, bedside instruction and visits to mines and factories for the direct observation of industrial hygiene. Much in this course is taught in our courses in surgery, but even so, it appears that Mexico is giving its medical aspirants better training in industrial medicine than most of our schools.

In February, 1937, Dr. Frederico Ortiz organized the First Mexican Congress on Industrial Hygiene and Medicine. The papers presented at this meeting covered a wide field and most of them have been published in pamphlet form. They included such subjects as minimum standards and cost of clinics for industrial workers, clothing of workers in various industries as related to hygiene and safety, rehabilitation, safety and disease prevention in its relationship to vocational training and selection, cement dermatitis, relation of childhood tuberculosis to silicosis, noise and its relation to ear affections, silicosis in ceramic factories, toxicology of mercury, of benzol, and of carbon monoxide, methods of indemnity or compensation, medical inspection of plants and factories. This varied list is significant of the widespread interest in this field of medicine.

Unfortunately, there is no Mexican journal devoted to traumatic surgery or occupational disease. As a second language more Mexican physicians speak French than English. In the adaptation of American industrial and agricultural methods lies the hope of Mexico's development. When these methods are used the Mexican industrial physician will meet health problems of industry similar to those we now have in this country. Our various journals of industrial health and safety are sensitive indices of what problems are being met. It appears to me that Mexican physicians would be at a great advantage in dealing with their future health problems if they were in contact with the American literature and thus acquainted with our advances and difficulties. Though I knew the publications of a few individual Mexican physicians who have made important contributions, I was not aware that industrial medicine in our neighboring country was so well advanced. A Mexican journal of industrial medicine would acquaint the medical world with the high standards that have been attained in spite of the serious social, education and economic problems which handicap its advancement.

Summary

MEXICO has had an effective Federal compensation law for six years. Though still undergoing modification it is now comprehensive and well administered. Clinical and experimental studies and field inspections are actively promoted. As Mexico's industries are less diversified than ours, their health problems are simpler. In many respects our own law is more liberal, but some aspects of the Mexican law and practice are worth our study, especially the greater time devoted to industrial medicine in the medical schools, the safety and hygiene committees with representation of both employers and employees, the central pathological laboratory for study of postmortem specimens, the equipment of Labor Department offices with x-ray and clinical laboratories, the pre-employment and periodic medical examinations, and the radio lectures on industrial medicine.

I wish to express my thanks to Dr. S. G. Meixueiro who gave me much assistance during my stay in Mexico.

Common Lesions of the Spine

Edward L. Jenkinson, M.D.,
Chicago

THERE are several conditions that I should like to discuss today and, naturally, there are also several that cannot be touched upon because of lack of time.*

Most cases of long neck are of no consequence, but you do occasionally see cases of long neck that are more susceptible to injury. The same is true of patients with a long lumbar spine; they have very little difficulty and probably are of no consequence unless they are injured.

Congenital fusion of the lumbar vertebrae is seen upon occasion. What other condition could cause this type of deformity? It is found in certain types of infection, or, in destructive lesions like typhoid fever, you may have this same picture. Usually, however, in the presence of infection you are able to outline it at the level of the articulating space, but in this congenital lesion you will find no evidence of intervertebral disc.

Another congenital deformity or anomaly is the absence of part of the vertebra. This condition may be due to the fact that the vertebra had two centers of ossification. Usually there is just one center, and if you have two, one of them fails to grow and a malformation results. Often times

* Read before the American Association of Railway Surgeons, Chicago, September 21, 1937.

where you have a break in continuity or separate centers of ossification of the transverse process, you have bilateral incomplete union of the transverse process of the first lumbar vertebra. That could not be due to recent injury. Not infrequently there is also displacement of the outer portion of the transverse process. Occasionally that may be displaced outward and then it may be difficult to say whether or not it is a fracture, but as a rule the ends are rounded and not sharply defined or cut across.

We have recently heard a great deal about ossicles. Usually they are of no consequence, but much material has been written lately on low back pain, and ossicles come in the discussion as a possible causative agent.

The ordinary spina bifida is another common congenital defect in the posterior arch of the last lumbar vertebra. You will have a great variation in the extent of failure of union, but usually the lumbar vertebra has three primary centers of ossification, five secondary, and ordinarily these are of very little consequence. We have seen a more pronounced spina bifida involving the lower dorsal spine, and occasionally you find this lesion in the cervical spine. Probably the most frequent location is the lumbar spine, the next most common is the cervical.

One of our patients, a youngster, had a spina bifida and as we looked at the x-ray closely we could see a break in the posterior arch with some narrowing.

The anteroposterior view showed that there was an extensive break in the posterior arch.

BILATERAL cervical ribs are seen fairly commonly. We have one patient who has two definite cervical ribs which are unusually long on the left side. This patient, so far as can be determined, had no symptoms referable to the cervical ribs. I refer to this patient for one purpose: a number of patients are sent in for examination to determine whether they have cervical ribs. I feel that because the x-ray examination does not show that they have cervical ribs it does not mean that there is no pressure from cartilage on that side which does not cast a shadow.

Often in spinal x-rays of a child there are shadows all through the anterior surface of the body. Those are due to the anterior spinal blood vessel or artery. As you know, early in life you find these indentations, and it was finally established by work done at Pennsylvania that these concavities with areas of rarefaction were due to the anterior spinal artery.

The condition is of no consequence and is normal in a child. You may see the same thing in Paget's disease.

We had an elderly patient who showed narrowing of the vertebra. Since this occurred without injury it was a problem to determine what had caused it. It may be due to pathological fracture. So far as we know she had no malignancy elsewhere. As you know, you may find a malignancy which will pick out one or two vertebrae. This patient had a marked disturbance in calcium metabolism. Usually we find more demineralization than this woman had.

Tuberculosis of the spine may start in the intervertebral disc. Usually these are examined early because of pain; in the central portion you may have no pain and the patient may go along without collapse of the vertebra. One of our patients has a marked kyphosis with narrowing of the vertebra with almost complete destruction. Many of the patients also have accompanying abscesses. We also had a patient who came into the hospital a number of years ago because of pain. On examination there was found to be narrowing of the disc, and that was all there was to see. So far as we could determine there was nothing in the vertebra itself. This patient was put on a frame, but the condition went on. We also had another case where there was some narrowing of the disc, and that patient went on to a complete recovery. Probably that lesion was due to some type of osteochondritis, whereas our other patient went on to definite destruction. Irrespective of the fact that she was on a frame, the lesion continued, and we treated it for three years and it progressively became worse. I talked to Dr. Ryerson about it and he felt that the spine should be fixed.

Some time ago we had a patient who had attended a medical meeting. Somebody pulled a chair out from under him and he went to the floor. He was taken to the hospital and examined closely and at no time could a fracture be seen in that vertebra. He continued to have trouble and x-ray made three months after the initial x-ray examination showed a Kummel's disease. There is narrowing of the vertebra. The articular surfaces are thickened. Probably the best terminology is posttraumatic collapse. So far as we know, he had no injury other than the one mentioned. Whether or not he had a microscopic fracture at that time, or whether he had an injury which caused disturbance of the blood supply and later on this necrosis, I do not know. In such conditions it is very important to do a lateral film, because often times the anteroposterior will miss the deformity. If this patient came into your office and you had no history of injury, it would be difficult to make a diagnosis of fracture.

Metastases following malignancy need not be multiple. Occasionally only one vertebra is involved or one bone involved. Generally, a metastatic lesion of a bone does not involve the articular surface until very late in the development of the disease. It is usually quite a while before the vertebrae collapse, and that is one method which is an aid in the differentiation between malignant lesions of the spine and the common lesions, such as infection. Metastatic lesions in the cervical spine have been rather rare in my experience. We have more commonly the type of malignant lesion that destroys, but we also have the osteoblastic type which usually follows carcinoma of the breast and causes sclerosis of the bone. These patients live longer and have less pain.

Occupational Disease Experience: Retrospect 1937 – Prospect 1938

— A Medical Commentator Reviews the Year's Events and Looks Ahead —

C. O. SAPPINGTON, M. D., Dr. P.H.,
Consulting Industrial Hygienist, Chicago

AT A TIME when nobody seems to be able to read accurately the business barometer and when, in fact, there seems to be doubt about there being such an instrument; at a time when it is rumored that Charlie McCarthy may be the next President-elect; and when the international situation may develop into anything from a mere disagreement to a world cataclysm, it is somewhat comforting to be able to point out that objectives relating to occupational diseases in this country, especially in regard to the study and control of occupational diseases, have reached a high point in their achievement during 1937.*

Important Meetings and Events

I WANT to review with you some of the leading events that have happened during the year. We start in February at Washington, D.C., with the National Silicosis Conference, where one of your Chicago men (Mr. Warren Cook) was Chairman of the Engineering Committee and rendered a very capable report. We also had reports from other Committees, including the Medical Control Committee, and we heard Secretary Perkins speak. Then to Chicago in April to the Symposium on Lead Poisoning by the Lead Industries Association; and in May to Detroit for the Midwest Conference on Occupational Diseases in conjunction with the Annual Meeting of the American Association of Industrial Physicians and Surgeons which was one of the most significant meetings. In May we had the Midwest Safety Conference in Chicago, which reached a new all-time high for interest in occupational disease subjects. In June we went to Cleveland where there was held an all-day session of the Ohio Safety Engineers Conference, considering occupational disease problems. In June to Boston to the Symposium on Chlorinated Hydrocarbons by the Harvard School of Public Health. In June also we went to Saranac Lake for the Third Silicosis Symposium, the best organized and attended of the three.

During the summer the United States was particularly honored by a visit from Dr. Luigi Carozzi, of Geneva, Switzerland, who represented the International Labour Office, for which he is technical adviser. My vivid recollection of Dr. Carozzi was his statement that we not only should know of the medical and engineering phases of occupational diseases, but also about the related compensation problems—which is what we have tried to point out for some time past.

In September there was the annual meeting of the American Bar Association, with special interest in the Section on Insurance Law; the meeting was held in Kansas City and they brought out some very interesting new things about which I shall say more later. Also in September there was the Symposium on Occupational Diseases here in Chicago, by Northwestern University.

Of great importance were the meetings of the Industrial Hygiene Section of the American Public Health Association held in New York City in October. In the same month there was the meeting of the National Safety Congress in Kansas City, Missouri; and again in October there was an Occupational Disease Meeting and Conference sponsored by the Michigan Department of Labor held at Detroit. I believe this was the first labor-sponsored state meeting of this type in this country. And finally, the last important meeting of the year I believe was the Air Hygiene Foundation Annual Meeting in Pittsburgh in November.

There are other events which are important, and, mark you, I do not say these are the *only* important events. For instance, the establishment of an occupational disease clinic by the U.A.W.A. in Detroit for the purpose of analyzing the various types of occupational disease difficulties. Also two Fellowships were established at Harvard by the Air Hygiene Foundation, in addition to research at Saranac and Philadelphia being maintained. Up to this time approximately 26 states have Industrial Hygiene Bureaus, in the Departments of Health mostly, although two are in the Department of Labor. This is a definite achievement.

Publications and Announcements

WHAT have been some of the most important publications and announcements in 1937? The Committee Reports from the National Silicosis Conference in Washington, D. C.; Book III. on the Pneumonokonioses, including the literature and laws; "Recent Advances in Industrial Hygiene and Medicine" by Ling; Report on the Symposium on Chlorinated Hydrocarbons at Harvard in June; report of a four-year survey on 10,000 foundrymen, as yet unpublished, by Dr. O. A. Sander, of Milwaukee; the Proceedings of the Midwest Conference on Occupational Diseases (which was the outstanding meeting of 1937 because it developed so many different points of information on a broad basis in regard to occupational diseases)—this was published in the May issue of INDUSTRIAL MEDICINE.

* Address before the Engineering Division of the Greater Chicago Safety Council, Chicago, December 16, 1937.

Report of the American Medical Association Committee on Air Conditioning, as reported in the *Journal of the American Medical Association,* (May 15, September 18, and November 27, 1937). Perhaps it is not known to most of you that the Association has a Committee on Air Conditioning. Another important publication was the Report of the American College of Surgeons on industrial medical service released in October; the report of the Medical Research Council of Great Britain on the toxicity of volatile solvents; "Statutes and Court Decisions" by the Air Hygiene Foundation, and just on December 11 the announcement by the American Medical Association in the *Journal of the American Medical Association* of the appointment of a Council on Industrial Health; finally, publication of Dr. Wm. D. McNally's "Toxicology" by INDUSTRIAL MEDICINE.

Compensation Experience

WHAT has been the compensation experience during 1937? Dermatitis has again been the leading reportable disease in the states where reports are available, namely, New York, Connecticut, and Ohio. There are other diseases, but dermatitis leads again by a great majority. As I pointed out this year in the Conference on Occupational Diseases held in Detroit in May, there are three states, New York, Ohio, and Massachusetts, that have shown for many years more than 60% of all reportable occupational diseases to be dermatitis.

The experience in Illinois has been illuminating and interesting. I cannot give you all the details, but here is some information regarding 220 cases filed before the Industrial Commission during the first year of operation, up to October 1, 1937; lead poisoning, 47 cases; indefinite complaints, 41 cases; silicosis, 33 cases; miscellaneous, 28 cases; tuberculosis, 23 cases; dermatitis, 20 cases; miscellaneous pulmonary diseases, 14 cases; silico-tuberculosis, 11 cases; and asbestosis, three cases. This makes up the 220 cases filed before the Industrial Commission within the first year of operation of the new law.

Court Decisions

NOW we come to the important court decisions, and it is here we look with a great deal of interest because those of you who know something of occupational disease experience realize what precedents are established by court decisions. The court decisions during 1937 increased in total number. (Perhaps I should say that these are based on published decisions in cases which have been tried, which means that these cases have come to higher courts either by appeal or on a writ from industrial commissions.) There was an increase in the decisions on cases of tuberculosis and in cases of lead poisoning. More states were represented this year in the decisions by the higher courts. There was an increased number of appealed cases of silicosis in Wisconsin. Lack of common law remedy was held valid in Illinois, just on November 30. There had been some doubt in the minds of people about common law action until the U. S. Circuit Court of Appeals handed down this decision.

There are two New York cases holding nationwide attention this year, the Bishop and the Goldberg cases. In the Bishop case the employee was a meat cutter who went in and out of ice boxes from time to time. He claimed that this caused him to contract the disease of tuberculosis. The Commission said that this was not an occupational disease and that it was not contracted because it had any relation to his employment. Bishop appealed. The Appellate Division of the Supreme Court of New York did not give a majority opinion but remanded the case for rehearing and completion of the record. Although it is not yet law, the final decision on this case is awaited with much interest.

Similar is the Goldberg case in which the claimant was a woman employed in a motion picture ticket booth. She claimed that because of an electric stove used in the booth her legs alternately swelled and contracted, which caused blotches on the legs and such weakness that when she went down the street she fell and fractured a bone in the leg, and that occupational disease was the cause of the fracture. An award was made by the referee and the decision was affirmed by the Appellate Division. The principles and opinions here are of great importance in their bearing on future cases.

Compensation for partial disability due to silicosis was denied in Ohio, Michigan, and Pennsylvania. There is a trend toward denying compensation for partial disability from silicosis to the effect that only permanent and total disability be indemnified.

Legislation and Code Experience

HOW about legislation and code experience in 1937? The New York code for rock drilling was passed, as you know. Briefly, where the rock contains 10% or more of free silica by weight, a maximum of 10,000,000 particles of dust per cubic foot are allowed: where less than 10% by weight, a maximum of 100,000,000 particles of dust per cubic foot are allowed. Prof. Drinker believes that this may be a very good code for the rock drilling industry but may not be adaptable to all other industries, as the tendency seems to be in some States.

Regulations for the use of parting compounds have been set up in California where they are permitted with not more than 1% of free silica, and in New York with not more than 5% of free silica. The Bureau of Mines also has a new code, A-19.

Also it is interesting that Delaware, Michigan, Indiana, Pennsylvania, and Washington have added laws for the compensation of disability arising from occupational diseases, making 21 States in all. You may remember that last year I prophesized that within five years occupational disease compensation would be general; you may also remember that I said that physical examinations would be universal in industry in 10 years. It looks like we are proceeding in that direction.

A committee was appointed in Georgia, Arizona, Kansas, Maine, Maryland, New Mexico, and Oregon to study the problem of occupational disease compensation legislation.

The limitations for exposure vary greatly in different States, from 30 to 90 days, and from two to five years. Limitations of filing time also vary greatly.

A most important achievement of the year, perhaps, was recognition by the legal profession and organized labor that pre-employment, periodic, and post-employment physical examinations are necessary for proper adjudication of cases and administration of laws. We have it that labor is not unfriendly to the physical examination if the records of these examinations can be retained by medical men and held in confidential relations. I have for many years pointed out that employment or industrial relations groups get hold of this information and innocently misuse it, even when the intent is of the best. We have emphasized that it should be confidential and held within the medical department only. It appears that this is coming to pass. I told you last year that I did not think that labor would long hold out against physical examinations, if the information was properly used.

Prospect 1938

WHAT is the prospect for 1938? I make bold to say what I think will happen. First, I believe there will be an increase in the number of occupational disease claims filed; that is natural. Second, an increase in the variety of cases filed. Third, more liberal construction of laws as reflected in court and commission decisions. Fourth, a relative increase in the number of claims, in addition to dermatitis. Fifth, greater consideration of, and more frequent statutory provision for, the use of medical examinations; that is an achievement we look to because we know there can be no real capacity for administrative control of occupational diseases laws unless they are supplemented and assisted by physical examination data. Sixth, the increased use of industrial hygiene surveys and correlation of engineering and medical data. Seventh, futher legal clarification of the definition of occupational disease, and this is important. Said Mr. Henry R. Sayer, when speaking of the occupational disease law in Illinois, this is not a definition but merely an exposition and taken very largely from the famous McNichols case of Massachusetts, in which the Justice probably was not speaking of occupational disease. Mr. Oliver G. Browne* recently said that it was absolutely imperative that we get a clarifying statement regarding what an occupational disease really is before we can expect to go any place in regard to the proper adjudication of cases. And in a group discussion before the American Railroad Association Mr. Browne described what he meant, which involved the same definition I set before you two years ago.

What about all of this anyway? What does it all mean? Where are we going? What are we going to do? The answer is contained in a confidential memorandum I received from the president of a representative corporation only a few days ago and with your permission I wish to read it because I believe it contains the essence of this problem:

"Business and industry survives by defending its rights. Personally I have had no experience with compromise. There is no compromising in business. Compromise is a law-making function but it has no place in industry or business. We business men are prone to fight, not militantly but tactfully, strategically, competitively. We are taught this, or rather we learn it, in the hard school of competitive business experience. The rules of clean competitive business permit no compromise. The personalities of executives, developed out of experience, become dissolved into the policies and regulations they themselves create for their companies. These policies of good and bad business, of defending right, are firm and fixed things. They are transferred from personalities right into corporate entities. The standards of character, integrity, sense of justice, the intent to meet every obligation and demand that others do so, the sense of fair play, the insistence upon a square deal, become as distinctly corporate policies as they do human characteristics. Such feebly expresses the policy of the assured, a policy of 85 years' standing. Mine is the distinctive duty not only of awareness of it, and of preserving it at all times, but of making it crystal clear in relation to this problem. Uncompromising right, privilege, ethics, reputation, good will of employee, customer, competitor, public, everyone, is a caisson in the foundation of good company policy. So the existing test of fortitude, the test of whether we shall permit the yielding up of our rights against what I believe to be unjust claims against my company are and have no doubt been clearly the visible problems confronting me individually. The stockholders of my company, not heretofore mentioned, are entitled to have their rights defended to the full. They employ me to do that in the handling of these matters. But they intend, in the company policy by which I am governed, that first and foremost all parties to a transaction, in any relationship, be treated with fairness and justice."

I submit to you that this epitomizes the feeling of American industry with regard to unjust dealing in the litigation of occupational diseases, and it sums it up so well and it is so timely that I read it to you.

The "Big Four" of 1937

AND NOW, before somebody asks me the question, what would I consider the most important events of 1937, I give you the "Big Four" of occupational-disease-problem achievements for this year:

1. The trend to develop devices which will give direct readings of concentrations and types of air pollutants. Yant has said that this is a "gadget" age and the public demands constantly something that can be plugged in, read, and turned off. Our English cousins have gone ahead of us on that.

* See INDUSTRIAL MEDICINE for October, 1937, page 544.

There is, as you know, a definite trend in this direction, and it is one of my four selections for the outstanding events of 1937 in regard to occupational disease problems.

2. The research of the Moore Engineering School at Philadelphia under the direction of Dr. S. Reid Warren, which will permit chest roentgenography standards to be brought under an improved scientific classification.

3. The establishment of two Fellowships each year at Harvard by the Air Hygiene Foundation. One of these Fellowships will be for a Doctorate in Public Health and will be worked for by an M.D.; the other degree a Doctor of Science in Engineering and will be worked for by an engineer. This will help tremendously in the building up of a qualified personnel, which is so greatly needed.

4. Recognition by the legal profession and organized labor of the fact that pre-employment, periodic and post-employment physical examinations are necessary to the proper administration of occupational disease disability compensation laws.

I have selected one event in the field of industrial hygiene engineering, one in medical science, one in education, and one which is a combination of medicolegal and labor application. These, then, are your gifts in the field of occupational disease study and control achievements during the year 1937, and with them go my best wishes.

Acute Chest Injuries

G. S. Baxter, M. D.

INJURIES of the chest are to a certain extent comparable with those of the abdomen and skull, in which attention is concentrated less on the parietal lesion than on the possibilities and extent of damage to the contained viscera.* Mechanical and physiological complications play a considerable part in the embarrassment of respiration and circulation. Shock is invariably sudden and severe, and may result from an apparently trivial injury, such as puncture of the pleura with a needle. The extent of internal injury is proportionate in the first place to the degree of the causative violence, but the secondary changes (surgical emphysema, pneumothorax, etc.) rapidly complicate the picture, which may be still further confused by infection.

Three main factors have to be considered in any thoracic injury:

1. The site of the initial trauma and the actual destruction produced at the time. This includes hemorrhage, laceration of tissues, rupture of lung surface with leakage of air, and so on.

2. Physiological and mechanical changes resulting from the above as exemplified by pneumothorax, pleural effusion, pressure on the heart from fluid or air in the pericardium and surgical emphysema.

3. Infection, localized or general, may arise soon after the injury or at a later date. Any penetrating wound will carry infection into the thorax, but its extent, degree and rate of spread will depend, as in other parts of the body, on a variety of factors; age, general condition, virulence of infection, etc. Infection also arises as the result of injury to the thoracic viscera themselves, and one has only to instance rupture of the esophagus or wounding of a bronchus to illustrate this method. Occasionally injury will cause a latent focus of infection to "flare" after a prolonged period of quiescence.

Injuries of the thorax in industrial practice, and especially injuries as a result of automobile accidents, have greatly increased in numbers and severity.

The severity of chest wounds is dependent upon the character and position of force applied and upon the type of injury to the chest wall or the intrathoracic contents. Injuries may be complex because of the large number of different organs which may be involved in the same injury. A simple chest contusion or squeezing of the chest may result quickly in a fatality. On the other hand structures within the thorax may be extensively injured with absence or only slight evidence of injury to the chest wall. Sudden applied force to the chest wall is likely to produce more extensive damage to the intrathoracic viscera than a gradually applied force. Such force will often result in a slight or severe laceration of the lung with a resulting tension pneumothorax or hemothorax. Not only the lungs may be involved in this character of trauma, but also other organs of the chest and abdomen may be damaged.

In a chest injury showing little external evidence but producing shock, one should expect an intrathoracic hemorrhage, lung collapse or mediastinal emphysema. If the shock should appear one or two hours later a hemorrhage arising from the pulmonary, intercostal or internal mammary arteries may be suspected.

Penetrating wounds are not as common as nonpenetrating wounds, but are usually more dangerous. All are attended with more or less bleeding, and upon this factor, plus infection, is dependent the relative importance and dangers. Extensive hemorrhage not only causes anemia and loss of heat, but the pressure effects on the lungs and mediastinal space are more important. The mere accumulation of non-infected blood and air produces no special harmful effects, except when increased air produces a pneumothorax, thereby completely compressing the lung and displacing the mediastinum and heart. Many times the accumulated blood in the pleural cavity is effective in relieving the bleeding from the lung substance. Open pneumothorax is more serious than the closed type, due to increased respiratory embarrassment, greater displacement of heart and infections of the pleura and lungs.

Simple non-penetrating wounds produced by blows, falls and run-over accidents may result in extensive accumulation of blood in the soft parts; rupture of muscle fibers causing mild shock, sharp pain on coughing or sneezing; or tenderness

* Read before the Surgical Association of the Rock Island Railway, Ft. Worth, Texas, November 17-18, 1937.

and painful, shallow respiration. By simple strapping of the chest, application of cold compresses and rest for a few days complete relief is afforded.

The bones most frequently fractured in chest injuries are the ribs, sternum and scapula. Treatment of these fractures should always be of secondary importance. A fractured rib, with or without emphysema or lung compression, should be immobilized with four-inch adhesive strips completely encircling the whole chest. These strips should be applied quickly at the end of expiration and with the patient's arm at right angle to or above the head.

Fracture of the sternum is one of the most painful and troublesome fractures of the bony cage. This fracture may be recognzed by point of pressure, ecchymosis, deformity, and the position the patient assumes in walking or sitting. Treatment consists in reduction by direct pressure and maintaining the same by placing the patient on firm, smooth surfaces and immobilizing with adhesive.

THE treatment of penetrating wounds consists in combating shock, arrest of hemorrhage and the prevention of infection. Shock, in some degree, is present in all chest injuries and its treatment is not different from other injuries. The shocked patient should be placed in bed with the feet elevated and warmth applied. Fluids should be given in quantities commensurate with bodily loss up to three or four liters daily. While fluids may be administered subcutaneously, intravenously or rectally, the most efficient method is the infusion of gum or glucose in saline solution. Morphine sulphate, gr. ¼ hypodermically, is a very useful agent in relieving pain, restlessness, and the lowering of the respiratory rate. Stimulants should be used cautiously and avoided in the presence of hemorrhage. In blood loss, the transfusion of blood in small amounts at frequent intervals is indispensable. It is sometimes convenient and necessary to use the escaped blood. If typing facilities are not immediately obtainable the blood of an unknown donor may be safely used by simply transfusing a small amount of blood. If, in a short time, no untoward effects are noted a larger quantity may be given.

Aspiration of a hemothorax should not be done in small collections of blood in the pleural cavity, neither should aspiration be relied upon as a diagnostic measure; however larger clots may be removed by aspiration after a period of two or three days. Since aspiration may be the direct cause of infection or be the means of re-opening a lung bleeding, it is safer to rely on the x-ray. Too, the presence of blood in the pleural cavity is less important than lung collapse, mediastinal and heart displacement.

If the periphery of the lung is ruptured allowing air to escape into the pleural cavity and thereby completely compressing the corresponding lung and partially collapsing the contralateral lung sufficiently to interfere with respiration, the air should be removed from the pleural cavity by inserting a cannula between the ribs and placing the thumb over its end during inspiration and releasing same during expiration. Decompression should be repeated until the patient is relieved.

Hemoptysis, a common symptom of most chest injuries, is of but little importance and usually requires no more treatment than morphine, strapping of the chest, ice compresses and rest.

All penetrating wounds of the chest should always and immediately be closed, either by suture or tight compress.

In large open wounds of the chest wall debridement should be done as in other wounds. Large sucking-in wounds are extremely dangerous and should be quickly closed. In all external open wounds an earnest attempt should be made to prevent the complications of pneumonia, pleuritis and empyema.

Bleeding from an intercostal artery may be arrested by applying a suture around the corresponding rib. Moderate or massive bleeding from the pleura or lung may be controlled by packing or suture. In massive bleeding, pulmonic in origin, an operation is indicated. A few bleeding cases result fatally before any assistance can be given.

Simple sterile hemothorax, even associated with a few days febrile course, is harmless and many times there is very little residual fibrin to cause harmful adhesions.

Spontaneous pneumothorax caused by the rupture of an old tubercle on the periphery of the lung which occurs as a result of a minor injury, or without injury, has received favorable consideration by some of our industrial commissions. The profession concedes this accident wholly due to an old healed tuberculous lesion and there is much doubt that injury is even an indirect cause. These cases, however, produce considerable shock, chest pain and dyspnea. Most of them recover after a few days bed rest. The lung ultimately is re-expanded and the patient does not suffer any permanent disability.

Since the World War there has been considerable literature relative to cardiac lesions produced by non-penetrating wounds of the chest. Rupture of the heart, injury to the aorta or great veins, auricular fibrillation, auricular flutter, aneurysm, heart block of varying degrees, have all been found associated with such chest trauma as direct or indirect violence, compression of the thorax between two solid objects, etc. Probing chest wounds, and indiscriminate searching for foreign bodies in the chest wall or cavity are to be avoided.

The extent of intrathoracic injuries can usually be determined by signs, symptoms and the x-ray.

A few case reports will illustrate the various types of chest trauma:

CASE No. 1: A young male adult was struck on the left chest in axillary line over the ninth rib, producing a mild contused wound which became infected, resulting in an embolic death.

CASE No. 2: A 17 year old boy was struck on the midsternum with a pair of pincers, producing a fracture of the sternum with overlapping of fragments which we were unable to correct. There

were multiple anterior chest wall abscesses, pulmonic infractions and later empyema.

CASE No. 3: Patient was walking along a railroad track and was side-swiped by a box car, being struck on the right shoulder. There was a fracture of the right fourth, fifth, sixth and seventh ribs in the axillary line with marked displacement of fragments and with no external evidence of injury. There was a 60% collapse of the right lung with deviation of the mediastinum to the left. Adhesive straps were placed around the chest; the patient was put to bed and given morphine sulphate for the relief of pain, and after a few days was discharged with less than 10% collapse and free of pain.

CASE No. 4: A 45 year old male was thrown from a wrecked automobile sustaining a fracture of the fifth rib; collapse of left lung; emphysema of left neck, chest, left groin, flank and scrotum and in a profound shock. He developed a painful cough, slight hemoptysis, fever, elevated pulse and shallow labored respiration. After 10 days the emphysema disappeared; the lung expanded and he was discharged.

CASE No. 5: A young man received a squeezing accident of the lower chest resulting in a slight laceration of the right lung, small hemothorax of the right pleural cavity and an almost complete compression of the right lung and partial collapse of the left lung. There was marked deviation of the mediastinum and the heart. He was in profound shock, pulseless, dyspneic and labored respiration. During the treatment of shock, a sufficient quantity of air was withdrawn from the right pleural cavity to afford relief to his respiratory embarrassment and cyanosis. He ran a fever ranging from 101 to 103 for a few days, after which the air and blood were absorbed and he made a complete recovery.

Conclusions:

IN CONCLUSION I wish to state that perhaps there is no field of industrial practice where prompt, intelligent and effective action is more necessary than in the treatment of acute injuries to the chest. This entails a thorough understanding of the biophysical laws of pneumodynamics as well as a realization of the dangers of injudicious and needless penetration of the pleural cavity by aspiration, etc.

Attention is further called to the fact that as in the case of skull and brain injuries, we have to consider injuries of the chest wall and the thoracic parietes and injuries of the thoracic viscera, remembering that any form of injury of the chest wall may coexist with any variety of damage to the viscera inside, and that there may be severe injuries to the thoracic viscera without any lesion of the parietes.

THE Twenty-Third Annual Meeting of the American Association of Industrial Physicians and Surgeons *and* the Midwest Conference on Occupational Diseases, Palmer House, Chicago, June 6, 7, 8, and 9, 1938.

Central States Meeting

— Abstracts of Papers of the Annual Mid-Winter Clinical Meeting, Cook County Hospital, Chicago, Friday, December 3, 1937 —

AT THE 1937 Annual Mid-Winter Clinical Meeting of the Central States Society of Industrial Medicine and Surgery, at the Cook County Hospital, Chicago, on Friday, December 3, 1937, the following program was scheduled:

"Diagnosis of Shoulder Joint Lesions"—FELIX M. JANSEY, M.D., Chicago.

"Reduction of Fractures of the Spine"—CHARLES N. PEASE, M.D., Chicago.

"Show Cases"—ARTHUR H. CONLEY, M.D., Chicago.

"Medical Problems in Industry" — LEROY H. SLOAN, M.D., Chicago.

"Statistics—Data of 12,500 Examinations"—ALFRED RASMUSSEN, M.D., Chicago.

"Burns—Treatment and Prognosis"—URBAN E. GEBHARD, M.D., Milwaukee.

"Improved Application of Bone Plates"—WILL F. LYON, M.D., Chicago.

"Occupational Dermatitis"—B. BARKER BEESON, M.D., Chicago.

"Personal Equation in Accident Causation"—HART E. FISHER, M.D., Chicago.

"Bone Tumors in Relation to Trauma"—CARLO S. SCUDERI, M.D., Chicago.

"Our Findings of Undulant Fever in Cattle and Hogs"—E. J. KIRK, M.D., Omaha.

"Vertebral Injuries"—E. C. EMERSON, M.D., St. Paul.

"Fractures"—JAMES J. CALLAHAN, M.D., Chicago.

"Examination Low-Back Industrial Accidents"—GEORGE L. APFELBACH, M.D., Chicago.

"Compound Fractures" — ROBERT L. KERRIGAN, M.D., Michigan City.

"Hip Joint Injuries"—WILLIAM R. CUBBINS, M.D., Chicago.

DR. JAMES J. CALLAHAN was the Chairman of the meeting.

In the evening, at the Palmer House, members congregated at dinner and afterward listened to "Diagnosis of Peripheral Nerve Injuries" by DR. THEODORE T. STONE, Chicago, and "Treatment of Peripheral Nerve Injuries" by DR. ADRIAN VERBRUGGHEN, Chicago.

DR. FREDERICK W. SLOBE, President of the Society, presided at the dinner meeting.

DR. FELIX JANSEY opened the program with a discussion of "Diagnosis of Shoulder Joint Lesions." The shoulder joint possesses less stability and less mechanical protection than any other large joint in the body and is consequently subject to a multiplicity of disorders. A brief review of the anatomy and kinematics of the shoulder joint was given together with a roentgen presentation of the relationship of these structures throughout the full range of shoulder movements. Minor

traumatic lesions of the shoulder joint including synovitis, sprain, strain, traumatic periarthritis and supraspinatus injuries were then discussed. Inflammatory and metabolic changes were given consideration with particular reference to subdeltoid and subacromial bursitis, and various points of calcification and rarefaction in and about the shoulder, including bursae, tendons, and the humerus, were also mentioned. Rupture of the biceps brachii, "snapping shoulder," recurrent dislocation, and partial and complete acromioclavicular luxations were explained with reference to diagnosis and treatment. The frequency of acromioclavicular exostoses was also commented upon, and skiagrams were presented of these and some other unusual shoulder lesions. A case demonstration was made, to show postoperative results.

DR. CHARLES N. PEASE, speaking of "Reduction of Fractures of the Spine," stated that it was not realized generally enough that compression fractures of the spine are reducible. In order for a patient to resume work, a normal contour of the spine is necessary. It is thought that it is necessary to keep the patient down at least 100 days for a successful outcome, since 120 days are ordinarily essential for healing. Series of lantern slides were shown demonstrating compression fractures of the sixth, seventh and eighth dorsal spine and reduction of this injury; calcification of the nucleus pulposus; another case of fracture of the spine in which the reduction was accomplished eight hours after the injury and the patient was up six weeks afterward. It was stated that one must reduce fracture of the spine within the first 17 days in order to obtain good results. A discussion of the Taylor brace was also given.

DR. WM. R. CUBBINS gave a resume of his long experience with "Hip Joint Injuries." A patient was demonstrated where the Callahan incision had been used and the operation which has been adopted more recently by the County Hospital group, was used to good effect. In the experience of the County Hospital group, every kind of means of reduction has been used. Experience with simple extension appears to have given better results than the use of the Whitman splint. Experience with pegs of various kinds has been disappointing. The best results obtained with the use of the Roger Anderson splint are when the cases are taken care of within the first two weeks. DR. CUBBINS concluded with explanation of the details of the anatomy of the Callahan incision.

DR. LEROY H. SLOAN demonstrated a group of cases relative to the subject of "Medical Problems in Industry." In the first case there was a history of tremor of the hands, slurring of speech and history of having fallen down several times. There was inability to use the arms and legs, particularly the peripheral portions. There was present some atrophy of the hypothenar eminent. There was double foot drop and atrophy of the anterior muscles. All of this picture pointed to a peripheral neuritis. There was also a pointed nose, teleangiectases of the face, fluid in the abdomen and dilatation of the superficial veins of the abdomen. The diagnosis was an alcoholic polyneuritis. In the differential diagnosis arsenic polyneuritis. diphtheria, carbon monoxide and diabetes must be considered. An important point of treatment is high vitamin A and B diet. Another case was demonstrated of a luetic aneurysm of the arch of the aorta, manifesting brassy cough. Two cases of cardiovascular disease in colored luetics were also demonstrated and the case of a white person with central nervous system lues. A case of a colored person with dilatation of the aorta in a female was also explained and demonstrated. A case of a white man complaining of dizziness and showing a blood pressure of 180/100, differences in the arms and the legs, being low in the legs, was demonstrated. There was visible prominent pulsations of the vessels, even in the interspaces of the ribs. This proved to be a case of coarctation of the aortic arch and the x-ray showed a notching of the ribs which was bilateral and symmetrical because of the prominence of the collateral circulation.

DR. ARTHUR H. CONLEY demonstrated a series of cases, the first one being a cervical Potts disease in a colored patient; this showed a developing retropharyngeal abscess, showing in the x-ray a defect in the second cervical body. A postoperative case of a child was demonstrated showing good results from a cervical laminectomy in a Potts disease. A case of a colored patient with long incisions in both the front and the back of the right leg was demonstrated; this patient was luetic, had pulmonary tuberculosis, Neisser infection, streptococcic infection of the knee, in spite of which the patient recovered with a painless, stiff knee. A very interesting case of a bone lesion of the knee joint was demonstrated; cystoscopic examination of the bladder showed yellow spicules; a biopsy on the specimen which was apparently a bone tumor showed the finding of a hypernephroma on microscopic examination; after several cystoscopic examinations, finally a pyelogram showed a hypernephroma; the important point to keep in mind is that in a number of bone tumors, the etiology is hypernephroma. Another similar case in which there had been a spontaneous fracture of the femur was demonstrated, and in this case, the tumor was suspected. Cystoscopically, the results were negative. However, at autopsy the findings were hypernephroma. Finally, a case of median and ulnar paralysis was demonstrated showing a Volkmann's contracture.

DR. ALFRED RASMUSSEN spoke on the subject "Statistics — Data of 12,500 Examinations." Of 20,000 examinations, 13,000 had x-ray films of the chest made showing the incidence of adult tuberculosis to be 1.8%—the incidence of silicosis to be 1.9% and heart lesions 0.7%. (Of this group there were 258 actual cases of silicosis.) The incidence of hypertension was 4.5%—of hernia 3.5%—and nephritis 0.6%. Of 7,500 pre-

employment examinations, 455, or 6%, were rejected; in the x-ray findings of this pre-employment group, tuberculosis showed an incidence of 2.0%—silicosis 0.7%—and heart lesions 0.3%. In concluding, DR. RASMUSSEN demonstrated x-ray films on pre-employment examinations in which there were no symptoms or physical findings associated; among these were the following: tuberculosis, multiple healed lesions of tuberculosis, fungus infestation, and silicosis associated with early tuberculosis.

DR. WILL F. LYON spoke on "Improved Application of Bone Plates." Bone plates should not be used if simpler methods will suffice; if used, the method must be properly adapted. By x-ray demonstration, fractures may be divided into four different groups and in the experience of Dr. Lyon these show the following classifications and percentages: (1) requiring no reduction 55%; (2) requiring reduction 25%; (3) requiring reduction and extension in healing 15%; and (4) requiring internal fixation 5%. In the latter classification, the fractures were mostly of the humerus and femur. Lantern slide demonstration showing fractures of the ulna and dislocation of the head of the radius was given. The essentials in bone plating appear to be: (1) the use of a strong, non-irritating plate; (2) the use of a metal type screw such as Sherman's; (3) proper sized drill which will provide the same diameter of hole as the base of the screw, to insure proper fitting; (4) perfectly centered drill holes; and (5) screws snugged in place, but not tightened unduly. In concluding, DR. LYON demonstrated his special apparatus for setting screws.

DR. B. BARKER BEESON next presented the subject "Occupational Dermatitis." It is believed that the patch test is important in contact cases and a general description of the test was given. Case demonstrations were given of a colored man aged 68 who had had bismuth therapy and showed a bismuth line on the gums and characteristic spots on the tongue; a colored woman who showed a crusted rash similar to impetigo over the face and chest; a white man with rash over the whole body which was an exfoliating dermatitis (this patient had formerly had psoriasis); a white man who one year ago bought a pair of blue socks and attributed his ringworm of the feet to this exposure—this patient also showed a rash over the legs; a white man who had congenital lues, showing flat nose and a gumma about the mouth.

DR. M. N. NEWQUIST gave an extemporaneous discussion of physical examinations in industry, and industrial medical service. Approximately 13% of expense is laid out for administration in industrial medical services; physicians should be more interested and do more participating in the administration of medical services. The former objections to examinations by organized labor now seem to have been cleared up considerably. Discussion was also given on the relationship of syphilis to industry. Discussion relative to physical examinations was given by DRS. SLOBE, HAMMOND, and SAPPINGTON.

DR. HART E. FISHER talked on the subject "Personal Equation in Accident Causation." Preceding his own subject, DR. FISHER discussed the physical examination program in which he has had considerable experience in his group. It was believed that a venereal disease program would be successful only when the results were retained as confidential. An appeal must be made to the highest executives in the group if progress is to be obtained. There is a big opportunity for physicians and surgeons in building up proper public relations. Accident statistics show an increase in the figures of those killed, permanently injured and temporarily injured comparing 1935 and 1936 figures. Most accidents occur because of (1) inability to visualize the possibility of an accident; and (2) lack of self-discipline, leading to continuous bad habits. The sources of accidents are motor cars, industries and the home, and all types have been on the increase. A lantern slide demonstration showing examples of inability to visualize the possibility of accidents and the lack of self-disipline was given. DR. FISHER concluded with a discussion of the drivers' license law.

DR. CARLO S. SCUDERI discussed "Bone Tumors in Relation to Trauma." It quite frequently happens that the x-ray appearances of bone lesions lead one to believe erroneously that injury was the chief etiology. DR. SCUDERI demonstrated by lantern slides and x-ray films a large number of instances where bone tumors were the source of the difficulty, including the following types of cases: lantern slide of a 15-lb. exostosis (benign) of the clavicle; sarcoma of the tibia at the knee; Ewing's sarcoma; a fusiform swelling of the tibia named Gray's osteitis; separation of the epiphyseal plates of vertebral bodies; a benign cyst of the humerus in a child; echinococcus cyst of the ilium; sarcoma of the femur at the knee (ulminating type); hemangioma of the vertebra; giant-celled sarcoma of the humerus, metacarpals, and phalanges; ossification of fibrosarcoma of the forearm; unilateral obliteration of the bone-marrow by sclerosis (eburnating osteitis monomalacia); a case showing 63 fractures at one time ("Marble bone"); Otho's disease (softening of the acetabuli); softening of the pelvis; skull tumor associated with aplastic anemia; and Hodgkin's disease of the ilia.

DR. JAMES J. CALLAHAN demonstrated a group of fracture cases. The first was a compound fracture of the left elbow joint in a young man which showed much comminution. This was wired through the wrist and given extension for six weeks, after which there was instituted gradual active movement. The next case was a fracture of the cervical vertebra and an injury to the left shoulder from a fall; this

instance demonstrated an occurrence where Critchfield tongs were better adapted to the case than the usual head halter. A rare case of epiphyseal arrest following surgical interference (with separation of the lower end of the femur) was fastened by a screw; an osteotomy was done and the patient is now on walking calipers after 14 weeks. There were then two demonstrations of the application of plaster casts, the first on a Colles fracture which was reduced under gas in the ampitheatre—manual traction was applied and the fracture then manipulated—the wrist was put in a neutral position with some ulnar deviation and flexion—the posterior plaster splint was then applied, and it was then wrapped with a muslin bandage. An actual demonstration of reduction of Potts fracture of the left leg was then given, applying manual traction with the knee flexed, manipulation of the fragments, slight internal rotation, application of the posterior molded cast and proper bandaging; this cast will remain 10 days, and then another posterior mold will be applied and then patient put into a walking iron for eight to 10 weeks. Finally DR. CALLAHAN demonstrated a sling used in fracture of the pelvis, with drop seat.

DR. GEORGE L. APFELBACH gave a demonstration of an examination for low back industrial injuries, using a very complete and detailed form of his own devising. This examination consisted in getting information on the gait, height and weight; inspection and palpation in the sitting position—as well as movements in the sitting position; examination in the standing position; examination in the lying position, examinaton in lying position on the side and also prone. DR. APFELBACH cited his own experience in commission cases, especially with reference to awards in cases which were not pathological. Especial emphasis was placed on malingering. In answering questions regarding lead poisoning, it was stated that the clinical examination is the most important part of the evidence and that laboratory findings are next in importance.

DR. E. C. EMERSON spoke on "Vertebral Injuries." The first part of the presentation was taken up by a thorough discussion of the anatomy of the cervical, vertebral, dorsal and lumbar vertebrae. Lantern slide demonstration of cases in reference to the anatomy of the injuries, and therapeutic measures, was also given.

DR. URBAN E. GEBHARD spoke on "Treatment and Prognosis of Burns." A great many cases have been treated by debridement and tannic acid spray. DR. GEBHARD favors the use of jelly with tannic acid incorporated in it. An experience was detailed with reference to 40 cases of burns from explosion. Motion pictures were shown in regard to the treatment of the burns resulting from this explosion and the results. An important item in the treatment of burns is the use of cod liver oil which has shown to give very good results.

DR. ROBERT L. KERRIGAN concluded the program with the subject "Compound Fractures." The important considerations are attention to shock, general care and treatment of the fracture itself. Especial emphasis was laid on the occurrence of fat embolism and comminution. There are certain associated lesions which are also important, such as tears of ligaments, particularly encountered in fractures of the forearm. A case was demonstrated of fracture of the end of the ulna, in the treatment of which excision of the radical head was done. The patient now has good position but a fibrous union. Finally, a case demonstration was shown of a compound fracture of the tibia, complete recovery and now walking, although there is some foot drop.

DR. THEODORE T. STONE spoke at the evening session on "Diagnosis of Peripheral Nerve Injuries," supplementing his discussion by interesting imitations of deformities produced by nerve lesions. There are not so many peripheral nerve injuries now as during the war. Among the different types of nerve lesions considered were injury of the radial nerve (wrist drop); median nerve ("ape" hand and "duck bill" sign); ulnar nerve (snuff box deformity and "claw" hand); musculocutaneous (unable to flex forearm or arm); long tharacic nerve of Bell (produces winged scapula); thoraco-dorsalis (marked adduction of arms); axillary (unable to elevate arm at shoulder); Jolley's paralysis (obstetrical lesion); Erb's paralysis ("Kaiser" arm); Klumpfke's paralysis (ulnar and median involvement); external popliteal (foot drop); posterior popliteal (impossible to elevate foot); and unilateral facial palsy. Of the occupational spasms, that which attacks typists was mentioned—there is no evidence of organic disease here, although there is some paralysis and loss of tactile sense. These persons should be placed in other work. An important point to remember is that in myelo-radiculitis there are root lesions with spinal cord findings, but rarely is there sensory loss. In establishing the status of peripheral nerves affected, if contraction is obtained with a faradic current after 10 to 14 days, the nerve is properly regenerating, but if contraction is obtained with a galvanic current, degeneration has taken place and it will probably take six months to regenerate; if contraction is obtained with neither faradic or galvanic currents, anatomical interruption has taken place and surgery is indicated. DR. STONE concluded his interesting demonstration with the showing of lantern slides depicting different paralyses.

DD. ADRIAN VERBRUGGHEN gave the concluding discussion on "Treatment of Peripheral Nerve Injuries," giving a lantern slide outline of the important points regarding the operative and non-operative treatment. The technique of various operations was also described in detail by the use of the outline. Important emphasis was placed on signs of returning function. It should not be forgotten that different nerves

react differently and these differences were given detailed discussion. Contra-indications and indications for operations were also given due consideration.

Hearing Aids

D. J. Marcucci,
Chicago

THE remarkable improvements which have been injected into electrical hearing aids within the past few years should justify the attention of every doctor and institution that dares to entertain the problem of the individual with subnormal hearing.* We may also include in this group, large firms which offer diversified employment and who, up to this time, have been obliged to discharge, with reluctance, some of their most conscientious employees because of poor hearing. The lack of a better understanding of what hearing adjustments are possible with the up-to-date hearing aids is costing the industrial and business world many valuable employees, who, if properly equipped with hearing aids could be retained in their positions, or transferred to other types of work for which they would be better fitted under the circumstances. It is tragic indeed, when otherwise recognized and capable individuals are thrown into the discard to shuffle for themselves. Much praise goes to the National League for the Hard of Hearing, which is represented in practically all of our cities throughout the entire country, for their part in preserving the morale of these individuals and assisting them in training for special work with the hope that they may again be accepted into the fold of the self-supporting. The sincere effort of this organization can certainly be made more productive by receiving the cooperation of firms who may be in a position to avail themselves of the services of such individuals who are, in many cases, above the average in character and ability.

While for many years the subnormal hearing public has been availing itself of hearing aids on a trial and purchase basis, this method is rapidly becoming obsolete. It is a recognized fact that the average person is apt to select smoothness of tone in an instrument in place of efficiency and articulation in the belief that the instrument most soothing to his hearing senses is the most efficient for his particular case. Unfortunately, the more pleasing tones, especially to ears unaccustomed to hearing aids, are in many cases the product of inefficiency within the hearing aid, i.e., on the basis that many noises to which the normal ear is constantly exposed, are generally high pitched. The efficient hearing aid may amplify these sounds only to distress the individual until he has become accustomed to this new vocabulary of sounds. On the other hand, if an instrument is inefficient in the high pitched sounds, many of the common noises will escape the ear, but much to the disappointment of the individual, he soon discovers a lack of intelligibility of speech.

The quality of sound which may be restored to the individual through an electrical hearing aid depends largely on the contour and level of the hearing and the ability of the hearing aid to cover a broad range of frequencies, especially the high tones.

Hearing indicating a greater loss in the middle or essential speech tones with both the lower and higher tones showing a milder loss, is probably the most ideal for the application of a hearing aid because of the inverse amplification curve of the average instrument.

Based on the fact that the quality of the basic or fundamental tone is determined by the number and relative intensity of overtones, and that overtones radiate toward the high frequencies, we cannot overestimate the importance of the high frequencies where a high degree of interpretation of sound and understanding of speech is required.

To support this view, Bell Telephone Laboratories tests, made by means of a practically perfect electrical transmission system which will transmit all frequencies up to 5,500 cycles per second, gave an articulation of 96.5%.

Similar tests, made with the electrical system so arranged as to transmit all frequencies up to 3,770 cycles per second but not transmitting sounds of higher frequencies, gave an articulation of 87.5%.

Further tests, made with the electrical system so arranged as to transmit all frequencies up to 1,950 cycles per second, but no higher frequencies, gave an articulation of only 73%.

Additional tests, made with the electrical system arranged to transmit all frequencies above 1,500 cycles per second but none below that frequency, gave an articulation of 75%.

While the day has not yet been reached when hearing aids can be prescribed to meet in every detail the requirements of the individual, and unfortunately, we fear that this practice is still very far removed because of the many factors involved, it is possible upon determining the acuity and quality of the hearing, such as can be accomplished with the No. 6-A Western Electric Audiometer, to evaluate a "Bone Conduction" or an "Air Conduction" type of instrument, and also to arrange the combination of component parts which will best satisfy the actual requirements with respect to the amount of amplification and the quality of tone for each particular case.

The representative portable hearing aid of today is essentially a miniature operated telephone consisting of a microphone and receiver; also a small amplifier when more power is required. The entire equipment is generally so light in weight and compact that it is no longer conspicuous and burdensome to wear. One very important development reflected in the modern hearing aid is the improved quality and range which has made possible a much broader application of the instrument.

The increase in the use of hearing aids by individuals having a comparatively mild impairment is particularly noticeable.

* Read before the Congress of Railway Surgeons, Chicago, September 20, 1937.

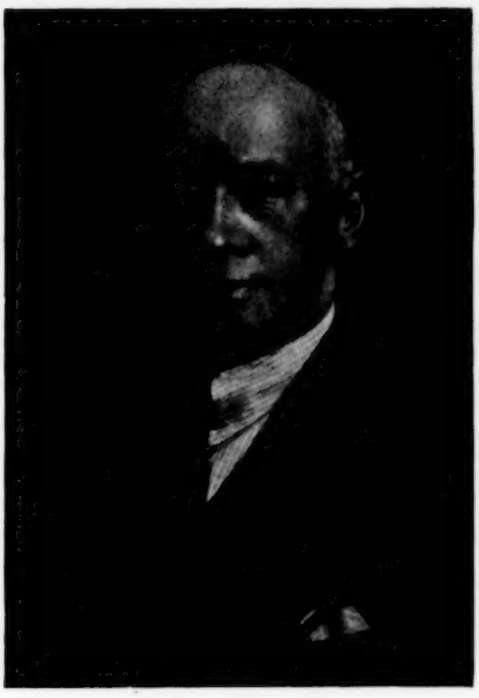
"Relieved from Active Duty"

—At the End of One Career: Capable of Another—

IN THE fullness of time as men live it, and in accordance with regulations made and provided for the uses to which they put it, there comes to some the age at which they must withdraw from the scenes and responsibilities of what have been their vocations.

This age is an average, dictated, for each employment situation, by the habits and customs of its development and the exigencies of its operations.

And thus, for the men therein, it is not a fixed point in the life of any, but a point fixed upon the inevitable years of all. For one it will be the terminal; for another, a mile-post near home; for still another, merely a transfer station, the beginning of the further part of the journey incomplete.



FRANK V. WHITING

This last may be, indeed, the hope of all. But it is, in occasional incidence, the reward of one whose personality so impresses his work that his work, in turn, inspires his personality to an individual status, which, when the work is ended—as it is for the subject of this sketch—leaves the man himself outstanding for, and because of, the fact that he is what he is. Where the rules attempt the "retirement" of such a man, they spell anachronism.

And so we shall not say that Frank V. Whiting has been "retired," but only that his years add up to the sum which the rules provide as the total of attainment coincident with his end of work. On November 30, 1937, he was, in the railroad idiom, "relieved from active duty" as General Claims Attorney of the New York Central System, at the close of nearly 27 years of service in that position, and of more than 53 years of railroad service. But all that really happened was that an important man and an important job had parted company at the time and under the circumstances appointed by the terms of tenure—the job to be taken over by a capable successor, and the man to continue in his own right as a capable man.

WHETHER for a good reason or otherwise, biographies of railroad men seem always written to a pattern; one differs from another by little more than the names and dates among the standard phrases. The following, of Frank Whiting, is illustrative:

"He entered the employ of the Lake Shore & Michigan Southern Railway Company as a telegraph operator at Cleveland, Ohio, on November 15, 1884. By gradual promotion, he was advanced to the position of clerk in charge of claims, in the office of the General Superintendent in 1893. He was admitted to the Ohio State Bar in June, 1897. On February 17, 1898, a separate claim organization was established on the Lake Shore & Michigan Southern Railway, and he became Chief Claim Agent. On February 1, 1909, he was appointed Claims Attorney for the New York Central & Hudson River Railroad Company, with headquarters at New York, and on April 1, 1911, he was elevated to the position of General Claims Attorney of the New York Central System."

Such might be viewed as sufficient for Frank Whiting in railroad history. But it is emphatically not enough to be the final word as to his place in the annals of industrial medicine. The half-century of his railroad career encompasses the whole panorama of this field, and his quarter-century as General Claims Attorney embraces its most rapid and comprehensive developments. He was identified with these things by virtue of his position; but he became entitled to a place among the far-visioned few whom we like to identify as "pioneers," because of certain qualities of his own. Although not an M.D., merely a lawyer, his inherent appreciation of the essential integrity of a number of the inchoate movements and ideas being then rather tentatively suggested, led him to identify himself with them in their beginnings, and to push them forward with characteristic vigor. For example, he quickly saw the inevitable importance of "safety" as an industrial-accident preventive, and the earliest appearance of the "Safety First" movement on the railroads — where it originated many years ago — found him seizing upon it for adaptation to the uses of his company. His railroad biographer says: "He organized and was placed in charge of the Safety Bureau on the System."

Next, in point of chronological enlistment of his interest, was the matter of superannuation of employees, in connection with which the railroads were outstandingly the first to install pension systems that were worthy of the name. "He was appointed a member of the Pension Board, and

when the Chairmanship became vacant he was the logical choice to fill the vacancy." Any one who knows him appreciates the inevitability that is connoted in that word "logical". His interest in pensions grew apace, and he became an authority on the subject. Not much aspiring to literary pursuits, his principal contribution to the scant bibliography of industrial pensions is a 12-page monograph: "Insolvency of Pension Plans and Remedies", studiously prepared and very clearly written. When the matter of the railroad employees' petition to Congress to enact the first pension bill in their behalf began to receive serious attention, he was, of course, in common with all railroad executives, on the defensive. But entirely aside from the exigencies of his position, his ability as a lawyer, and that more-than-suspicion of the judicial in his make-up, perceived that the proposed bill was unconstitutional—as the Supreme Court determined after it became law.

BUT chiefest, in the specific relations to industrial medicine which endear him to all who have its interests at heart, have been his steady furthering of, and fairness in, the improvement of the methods of examining applicants for employment, and his firm insistence on the periodic medical examination of certain classes of employees.

Even from the standpoint of his duty as Claims Attorney, he was always primarily fair to the individual employee. And the more than 600 Surgeons of the New York Central System become quickly aware, and have remained permanently proud, of this quality of his temperament. And when he suggested that they organize their own association, the Association of Surgeons of the New York Central System—which now has a successful history of 15 years of mutual cooperation—they organized it, and made him their Executive Secretary. The Annual Meetings of this Association are among the most interesting and instructive of the year—due, in no small part, to his deep interest not only in the organization, but also in the Surgeons themselves and the work in which they were engaged. In a large, and a real sense, where some whom we have mentioned in these columns from time to time, are "fathers" of industrial medicine, Frank Whiting is a beloved "godfather" of railroad medicine and surgery.

HIS years of active duty in the place that has been his career have come to their appointed end. But the years of his active interest in the things that balance up the good life are still at zenith. Many know him, many call him friend; but all, and many more, would like to know him better. Possibly now, when his hours can be adapted more to inclinations than demands, some will have that privilege. As he leaves the immediate area of his long associations, there is unanimous congratulations—and, perhaps, a little envy—that he has come to the designated time of the close of one successful career while still in that prime of personality which can launch another. The "every good wish" of friendliness, respect, and appreciation goes with him. And the next meeting of the New York Central Surgeons—and the next after that, as long as he shall be here—will miss him; unless, as we hope, he's there as usual.

Gastric and Duodenal Ulcer

—Practical Considerations—

LOWELL D. SNORF, M.D.,
Chicago

THE subject of peptic ulcer has been so thoroughly covered for so many years that I hope not to bore you by presenting a few observations that I have made which may perhaps be helpful.*

As a matter of fact, there has been very little change in the subject of ulcer until the last part of the last century and particularly the past 25 years. Perhaps the chief reason for the discussion of this subject today is to bring to your attention again the fact that first of all in the conception of ulcer we must recognize it in its incipiency if we are able to increase the percent of cures of ulcers; secondly to apply a conservative view in our approach to the treatment, and finally, to display meticulous attention to details both in possible etiological factors and treatment.

Little more is known of the underlying factors in peptic ulcer today than 50 years ago. There is much less discusion on the relative merits of medical and surgical management at the present time, due perhaps to a better appreciation of the limitations of each regime. I recall that slightly less than 15 years ago more than average feeling was displayed in a symposium on the treatment of peptic ulcer. The discussants were Bevan, Mayo, Cole, Sippy, Alvarez and Brown. Some difference in opinion was justified due to difference in type of patients in various clinics. That is, the cases referred for surgery were often suffering with obstructions of varying degrees, while in the medical group perhaps a higher percent of non-obstructive lesions existed. There is today some difference of opinion, but the area of "no man's land" has been considerably narrowed.

An intelligent treatment of ulcer must depend upon an understanding of the etiological factors involved. We are not very much closer, perhaps, to the exact etiological factors in a given individual with ulcer than we were many years ago. We, however, realize that there are individual variations, fundamental changes in individuals that influence the production of ulcer, and it is probable that not one factor but a number are concerned in the production of the lesion. Some of these factors I might mention briefly, and I should like to present them in this order:

SYSTEMATIC INFLUENCES: Perhaps at the head of these we might put infection. We have accepted for a long time, due largely to the work of Rosenow, that ulcer of the stomach and duodenum was closely related to infection. It has been possible to produce ulcers in experimental animals by

---

* Presented before the American Association of Railway Surgeons, Chicago. September 21, 1937.

injecting infected material obtained from some focus of infection of the ulcer patient. That is not wholly conclusive, but it is very suggestive. In the treatment we consider, therefore, the first of these factors of etiology, and that is infection from tonsils, teeth, sinuses, and other organs in the abdomen. As an example, one man on my service in his early thirties had three major gastric operations. A duodenal ulcer was resected and a gastro-enterostomy performed; a marginal ulcer was resected and the gastro-enterostomy was undone; finally a third ulcer on the lesser curvature was treated by partial gastrectomy, but he had a recurrence which brought him to the hospital again. He had had the advantage of careful medical dietary regime, including alkalies, rest, etc., and yet under our very close observation he again presented symptoms of recurrent activity. At this time the onset of trouble was coincident with infection of the upper respiratory tract. After a careful check we found that he had evidence of a chronic sinus infection. It has not been our experience to find many ulcers that seem to have been related to sinus infection, but here was one which, after removal of the chronic sinus difficulty, had complete abatement of ulcer symptoms; he has had the longest period of freedom from his ulcer that he has had since its inception. Many examples could be given of relationship to infected teeth and tonsils, and I believe infections of the upper respiratory tract have not been sufficiently emphasized.

Nutritional factors play probably a greater part in the production of ulcer than we have been able to evaluate or thus far suspect. With the advent of more knowledge of the complex vitamins I believe we will find, if not necessarily a causative influence, at least a factor to be considered in treatment. We have found vitamin C deficiency based on ascorbic acid blood determination following frank hemorrhage from ulcer. Others have noted this, but no interpretation as yet has been made. There does not seem to be an adequate correlation between dietary deficiency and ulcer recurrence to place this as a foremost causative factor.

Allergic disturbances have been not infrequently noted and on occasion have definitely had a part in the recurrence of symptoms. Perhaps it is not too long a cry to assume an analogy between canker sores due to allergy and peptic ulcers.

The constitutional and neurogenic factors are indeed difficult to evaluate, yet no one will deny the relationship between emotional imbalance, effect of worry, etc., and the precipitation of ulcer symptoms.

ACID-PEPSIN ACTION: The digestive action of gastric juice was particularly emphasized by Sippy. This specifically and the disturbance of the acid factor in general should be constantly borne in mind to best explain the peculiarities of ulcer. The relationship of pain to a certain period of gastric digestion, the chronicity and even the complications and sequellae are best explained on the basis of this theory. No attempt is made to make this the sole etiologic cause, but your attention is again directed to this important factor.

NOW the care of the ulcer patient is not a matter of considering surgery immediately or being adamant with any treatment other than medical, but consideration of the lesion as it is. The early and uncomplicated ulcer of the stomach or duodenum is not going to be materially benefitted by any surgical procedure. The younger the individual, the less likelihood of satisfactory surgical results and, therefore, one of the prime contra-indications to surgery would be an early, uncomplicated ulcer in a relatively young individual; and as a correlation to this, given a young individual with an ulcer or an old individual with an ulcer of short duration, a medical regime is definitely indicated. Nor should one be so exercised in dealing with a gastric lesion. It is sometimes very difficult indeed to differentiate between an ulcer and early carcinoma of the stomach on the basis of the x-ray or symptomatology. Yet we are quite optimistic that this can be done if one follows this lesion carefully during a two- to three-week ulcer management regime. If then there is doubt, the patient should be given the advantage of surgical exploration at once. The care of any ulcer patient should be very meticulous. Attention should be given to those factors that I mentioned before, all of which can contribute to causation of ulcer. Whether it be infection, the possibility of allergy, or whether there are nutritional disturbances, all should be seriously considered instead of laying out a plan which at the outset says: this is your diet, this is your medicine. Direct attention should be given at once to the factor of rest and relaxation, secondly to the method of diet, thirdly to the consideration of medication, and, fourth, to make the patient fully understand his problem in order to cope with it.

We still use the alkali therapy of Sippy and believe it beneficial. Alkali, used according to this plan, has probably proved to be more and more valuable and is accepted with more and more favor. It must be said, however, that excessive alkali must not be given, and that alkali to the point of disturbing the nutrition of the individual is harmful. In the presence of continued secretion and continued symptoms in spite of the administration of alkali, we have used aluminum hydroxide preparations with success.

Mucin, which was developed at Northwestern Medical School by Fogleson and Ivy, has its adherents. It probably is of a great deal of value, although it has not proved to be a specific in ulcer treatment. Such medicines as atropin, belladonna, bromides, barbiturates, etc., have a very limited use. If they have any value it is simply to calm the nervous set-up of the individual. I think they have very little direct effect on the stomach.

Mann and Ivy, in their experimental laboratories, have shown us more, perhaps, of the inside

treatment of ulcer than the pathologist or the roentgenologist, and even the surgeon. Ivy has shown that the ulcer in the dog will frequently not be healed by alkali; perhaps slightly more by mucin; but that alkali and mucin together seem to be highly favorable. They have also shown that rough, coarse foods will not only continue to irritate the ulcer but will actually on occasions also produce perforation. Now, if that is true with the dog, it is reasonable to apply the analogy to man, so that the treatment of the peptic ulcer patient by the ambulatory method and the ordinary soft diet with a bit of milk now and then seems to be a hopeless and helpless way to attack the problem. If the patient is to succeed with his treatment, he must be given information just as seriously and carefully as the patient who is getting advice for diabetes. No diabetic patient is successful if given a little bit of advice and a diet that is carelessly presented. Sooner or later he gets into trouble.

The patient with an ulcer, if recognized early, runs a 75% chance of getting completely well. If the ulcer is allowed to go along for a long time and complications develop, his chances of satisfactory medical result will be probably not more than 50%.

THE major complications of ulcer are carcinoma, hemorrhage, perforation, and occasionally alkalosis. The problem of perforation is almost always a surgical one. The problem of hemorrhage is almost always a medical one. When we are dealing with obstruction, we must bear in mind that obstruction means narrowing at the outlet of the stomach, usually due to duodenal ulcer. Frequently, however, it is not due entirely to scar tissue narrowing, but to edema. Probably not more than 20% of the patients with obstruction should be operated upon, and the decision cannot be made as to whether that patient should be operated until he has been observed medically for some two to three weeks. If with rest, soft diet, secretions controlled by alkalies, mucin, and aspirations, the obstruction fails to be relieved then surgery is at once indicated. Very frequently indeed the obstruction will subside and complete healing result.

IN SUMMARY may I draw your attention again to the following.

No definite etiologic factor for ulcer has been proved.

In a given instance there are probably several factors definitely influencing not only the onset of the peptic ulcer but also its recurrences and complications.

The treatment should be directed toward a relief of symptoms but also an eradication of the probable exciting causes.

Certain definite indications for surgery are excepted — suspected carcinoma, perforation, and scar tissue obstruction at the outlet. The borderline situations should be carefully considered before a definite conclusion is voiced. When we consider the definite mortality and expected morbidity due to disturbed gastric physiology, surgery should not be entered upon lightly, and when finally done consider the causative factors as infection and nutritional disorders before finally dismissing your patient.

Discussion:

QUESTION: What is the value of injection of histidine?

DR. D. F. FITZPATRICK, Iowa City, Iowa: Dr. Snorf's discussion of the difference between surgical and medical treatment for gastric ulcer might apply very well to younger individuals, but I noted that he said something about the medical treatment in these individuals who have hemorrhage. That may be a very good treatment for young people who have elastic arteries but when an elderly individual has hemorrhage from the stomach and has severe bleeding I wonder if the treatment is so good. I think that surgery and surgery at once is indicated, because within the last year I have had two elderly individuals with gastric ulcer. They were treated by diet and rest in bed and morphine and atropine and still they went on hemorrhaging and died of hemorrhage. At autopsy it was found that the arteries in these ulcers did not collapse and the patients bled to death. If these patients had gone to surgery immediately on the recognition of their gastric ulcers and hemorrhages I think they might have been saved.

DR. LOWELL D. SNORF, Chicago, (in closing): Histidine has now been used for several years with indefinite success. My own experience has not borne out the enthusiasm manifest by others. In 17 accurately controlled cases with moderate obstructive symptoms we observed no benefit from histidine. In the more acute cases I was of the impression that the symptoms were somewhat shortened. You will recognize, however, the possibility of psychic influence.

The criticism just offered with regard to surgery of patients with hemorrhage is good. However, not more than 5% of patients with hemorrhage succumb, and with few exceptions that group comes in the arteriosclerotics. In the hands of a competent surgeon who realizes the possibility of arteriosclerosis as a factor, an emergency operation might be justified. Conservative management must be followed wherever possible, because if we are to operate all the cases of hemorrhage we will have a higher mortality than 5%.

Organized Industrial Medicine

— What Has It to Offer Industry and Insurance Carriers? —

AARON SAMUEL LEVEN, M.D., DR. P.H.,
Chicago

OF ALL the forms of practice which the medical profession offers, that of industrial medicine and surgery is one of the most fascinating, not only from the professional interest one finds in it, but also because it has a direct relationship to, and a bearing on the social and economic situations of human beings to a degree not found in any other field of the practice of medicine. At once it can be seen that, from the social and economic point of view, the employee is an economic unit. The employer is responsible for, and is held accountable by law in the event of, any injuries or occupational diseases (the latter being a more recent development) which the

employee may sustain or contract while in the course and performance of his regular duties.

Professionally, the industrial surgeon must have not only a thorough knowledge of medicine and surgery as it relates to industry, but also a well-equipped office, modern in every respect, organized and conducted as efficiently as the operating room in a good hospital. In addition, he must, for many obvious reasons, keep accurate and complete records. The physician practicing in this branch of the healing art, necessarily deals with groups of individuals—with mass humanity, so to speak. His contacts are not only with employees, but also with the officials of the industrial concerns that employ them; with industrial commissions and boards; with industrial engineers; with insurance companies (carriers); and, to a greater extent than is common among the profession as a whole, with the judiciary. Thus, in addition to his actual professional knowledge, the industrial surgeon must have contact with, and a knowledge of, medicolegal, medico-engineering, and socio-economic problems which is rarely encountered in the routine private practice of medicine. For his work has a direct bearing on the economic situation of the patient as well as of other people. He must be able to estimate unbiasedly, scientifically, reasonably, and as accurately as possible, the patient's disability, and the time and degree of permanency if any, because the patient receives compensation for accidental injuries or permanencies, or death, which may arise out of, and in the course of, his employment, and every self-insurer or insurance company, insuring against the same, must maintain adequate funds to meet such liabilities. It is readily seen, therefore, that the financial and economic status of the worker and the other economic units are thereby seriously affected, and the industrial surgeon cannot guess in respect of this affection because guessing only reflects on his integrity and qualifications.

The first compensation laws which were passed in this country date back a quarter of a century. The rapid growth and development of our complex industrial life with its attendant acute hazards, more pronounced than ever before, with its intricate machinery, power-driven tools and appliances, as well as intensified chemical processes, make conditions today, from the industrial point of view, and especially from the medical point of view, more acute, and of ever-increasing gravity. The conditions are uncertain, and extremely complicated, not necessarily new, but due to exposure and to the use of modern machinery. In view of all this, workmen's compensation laws have been altered from time to time, and the management and treatment of industrial cases have progressed accordingly.

The statutes on workmen's compensation vary in many respects as among the different states. As to these variations, suffice it to say that the basic principles of the laws and the underlying purposes and objects of the statutes are to permit recovery for damage and to compensate the injured person for either temporary or permanent loss of earning capacity which arises out of, and in the course of his employment, so as to tide him over the period of financial deficiency resulting from his lost earning power. The average worker knows little or nothing of the subject of compensation. His only concern is that he should be compensated if he gets sick or injured from any cause whatever while at work.

Workmen's compensation laws are administered and operated by industrial accident boards and commissions, and although these commissions have a political importance—and indeed this is the chief obstacle to a just and equitable settlement in many cases—and although they have the final say in determining the exact amount to be paid to the injured person for injuries sustained, nevertheless, the workmen's compensation laws and their commissions, as well as the insurance companies are greatly dependent on the industrial surgeon for their successful professional, economic and med colegal operation.

INDUSTRIAL injuries are of a compensable nature, and the industrial surgeon treating such cases immediately recognizes the fact that several agencies are directly concerned: (1) The employer or his carrier; (2) the employee; (3) the industrial commission. The industrial surgeon therefore knows that he must be unbiased and interested in the case purely from a scientific point of view (which is the primary requisite for the industrial surgeon) for only then can all those concerned rely in confidence on his findings and opinions.

The field of industrial medicine and traumatic surgery as a department of the practice of medicine, and the distinction of the industrial surgeon as an expert in the practice of medicine, are realized not only from the professional, medical sphere, but reach their full distinction in the medicolegal field. Testimony on questions of permanent injuries and evaluation of disabilities involve the industrial surgeon in a proposition that is not the usual sphere of the average practicing physician and surgeon. The industrial physician and surgeon is alone in the medical profession in making a definite effort to develop a scientific basis for interpreting and appraising the end results of any injury in terms of mathematical or monetary values.

This effort is entirely foreign to the usual reasoning and prognostic determinations of the average practicing physician, who is not accustomed to being definite. In his practice he constantly deals and meets with uncertainties. He is only too well-acquainted with the perplexities and superfluities of human nature and human weaknesses, and tries to account for them by making indefinite, patronizing expressions, which are at times too optimistic, and always sympathetic for the psychologic benefit of the patient. So, when the average practicing physician is confronted with a proposition which has on one side a claimant who is entitled to, and expects, a monetary remuneration for damages to his body, and on the other side an employer, or an insurance com-

pany, who is forced by law to pay for such damages, he is not altogether impartial, nor scientific in many instances, nor is he certain in his appraisal of such a problem, for he is not informed or perhaps does not care to know or take into consideration the many conditions which he must realize, and that there are several agencies besides the patient who are directly interested in such situations.

The industrial physician alone, through special study and training, realizes that in evaluating the disability of an injured person, he must consider the factors of vocational loss, of functional, cosmetic loss, of earning capacity and adverse influence in securing employment. There is only one common ground on which medical analysis of a physical handicap may stand, and that is the status of function. Only the medically-trained physician, the traumatic surgeon or orthopedist, is capable of determining fitness through analysis of function. He alone knows how to estimate the effect of physical damage to the anatomy and the resulting physiological changes which take place. He does not need to rely in any way on sentiment, emotion, or economic factors. The industrial surgeon because of his experience in his field is indeed expert in evaluating njuries in terms of mathematical or monetary values.

INDUSTRIAL medicine and surgery has made tremendous progress in the last two decades. The designation "Industrial Medicine and Surgery" does not mean that it is a specialty of medical practice, but it does mean that it is the manifestation of all specialties, the application of all medical and surgical principles, specific to, and inherent in the nature of, the problems of the special field created by the contract of employment.

The specialties of the eye and ear, roentgenology, occupational therapy, etc, are well recognized. Neurologic and psychopathic specialists, or, I should rather say, physicians specializing in neurology and psychiatry, are also highly respected for their opinions. It seems to be taken for granted, however, by some misinformed insurance claim adjusters or even industrial commission arbitrators, that any practicing physician is capable of expressing an expert opinion on the extent of damage or loss of function, say in a back injury, or a disability or deformity from a fractured bone in the leg or hand. What they do not seem to recognize and realize is that the intricate mechanical disturbance of an injured extremity or spine requires a highly-developed technical knowledge of anatomy, physiology and function, such as only an orthopedist or a physician experienced in traumatic surgery would have. No wonder well-trained attorneys are quick to discover and capitalize on incompetent and loose diagnostic expressions of physicians who are not well-qualified in this work!

Now just what has organized industrial medicine and surgery to offer to industry and insurance companies? In previous years industrial medicine and surgery had a "slumberous career." It is true, however, that individuals and small groups of industrial physicians have done splendid pioneer work in this field, but until recently employers as a whole, as well as some insurance companies, have failed to sense the tempo of these efforts. As stated, industrial medicine and surgery has grown tremendously in recent years. Furthermore, by giving industrial medicine the recognition it deserves, the organized industrial physicians and surgeons are stimulated and activated towards greater efforts and efficiency, and other competent physicians and surgeons are being attracted to this specialty.

TODAY, therefore, industrial medicine and surgery is *organized* to foster the study and discussion of the problems peculiar to the practice of industrial medicine and surgery; to promote the art and science of industrial medicine and surgery; to develop methods adapted to the conservation of health among workers in industry; to promote a more general understanding of the purposes of treatments and results of the medical care of injured and sick employed; to disseminate accurate medical knowledge in reference to the diagnosis and latest methods of treatment of all conditions arising out of and in the course of employment.

Organized industrial medicine and surgery brings into one organization the industrial physicians and surgeons, whereby frequent meetings with full and frank interchange of views may secure intelligent unity and harmony in every phase of their labor, and elevate and make effective opinions of those members of the profession who are engaged in this field in all its scientific, legislative, public health and material affairs. In this manner the collective experiences of the physicians and surgeons of organized industrial medicine and surgery can be used in the solution of common problems relative to the interest of those in this work, and of those with whom they come in contact more than with any other person or group of persons—the insurance adjusters and the insurance companies. This is what organized industrial medicine and surgery has to offer industry and insurance companies.

References:

1. LEGGE, ROBERT T.: "The History of Industrial Medicine and Occupational Diseases," *Indust. Med.*, July, 1936, pp. 371-77.

2. KOBER AND HAYHURST: "Industrial Health." P. Blakiston's Son & Co., 1924, pp. 1000-9.

3. HAYHURST, E. R.: "Health in Industry," *Am. J. Pub. Health*, October, 1934, p. 1041.

4. SHERMAN, P. TECUMSETH: "History of Workmen's Compensation for Occupational Diseases," *Bull. Association of Casualty & Surety Executives*, July, 1935.

5. FISHER, HART E.: "Employee Health Security," *Indust. Med.*, September, 1935, pp. 489-92.

6. MCBRIDE, EARL D.: "Disability Evaluation." J. B. Lippincott Co., 1936.

7. SAPPINGTON, C. D.: "The Evaluation of Physical Defects," *J. Indust. Hyg.*, January, 1929, pp. 4-9.

8. U. S. Dept. of Labor: "Survey of Labor Laws Administration," *Bull. U. S. Dept. Labor*, July, 1936.

9. PAYNE, MARSHALL: "Modern Industrial Surgery," *Indust. Med.*, March, 1935, p. 136.

10. JONES, F. ROBERTSON: "Compensation for Injuries." *Bull. Association Casualty & Surety Executives*, November, 1935.
11. "Industrial Medical Trends," *Indust. Med.*, January, 1936, pp. 39-40.
12. GROVES, E. W. H.: "On Treatment of Fractures and the Waste of Money and Time Caused by Unorganized Methods Dealing with Accidents." Abstr. *Labour Management*, London, October, 1935.
13. DUNCAN, E., JR.: "Preliminary Management of the Seriously Injured," *J. Tennessee M. A.*, November, 1935, pp. 445-449.
14. MCCAREY AND MCGILL: "Some Anatomical Points relative to Infections of the Hand," *Canad. M. A. J.*, 1934, p. 683.
15. KOCH, SUMNER L.: "The Diagnosis and Treatment of Acute Infections of the Hand," *J. Indiana M.A.*, 16, 1928.
16. HAMMOND, FRANK P.: "The Traumatic Fakir," *Indust. Med.*, October, 1935.

Important New Books

Reviews by

C. O. SAPPINGTON, M.D., DR.P.H.

Trauma and Disease

FOR a long time the medical profession has needed a thorough discussion of the relation of trauma to disease, such as is represented by the book of this title, edited by DR. LEOPOLD BRAHDY, Physician in Charge of Industrial Diseases and Accidents, in the office of the Corporation Counsel, New York City, and DR. SAMUEL KAHN, Medical Examiner in the Bureau of Workmen's Compensation of the Department of Labor, State of New York, New York City, and as formulated by 24 distinguished contributors, each one an authority in his individual field of medicine and surgery.

The need and purpose of this book are well expressed by the authors in the preface: "The role of trauma is unquestionably overestimated by the lay public. On the other hand, however, there is a tendency on the part of some physicians to deny the significance of injury to too great an extent and on a doubtful theoretical basis. Such knowledge as we have is incomplete and, therefore, some diversity of views and opinions among competent physicians is to be expected. Long observations have convinced us, however, that differences of opinion arise far more often than they should, solely because many physicians are unfamiliar with the entire subject. The literature is meager except for case reports and statistics of questionable value, and shows that few clinicians have formulated their opinions on the relationship between injury and disease. Reliable articles on trauma are widely scattered in medical journals to which the practitioner usually has no access. Medical textbooks continue to list trauma among the etiological factors in many diseases, merely because somewhere, sometime, someone collected statistics which seemed to indicate that trauma played a role in their causation. In some texts, the fact that other diseases can be caused or accelerated by trauma is either ignored or stated with unwarranted skepticism, and no data are given on which the physician can base his own opinion.

"The purpose of this symposium is to present the accumulated knowledge concerning the relationship of a single trauma to disease, to indicate the limitations of this knowledge, and to develop the underlying principles on which, in any given case, the medical opinion should be based. Conditions which are obviously caused by a single trauma (sprains, fractures, lacerations) are not included; nor are those diseases discussed (except incidentally) which may be related to *repeated* traumata. The subject of this volume is the effect of a single trauma—either physical or psychic—in producing disease or influencing its course."

The material is considered under the following subjects: trauma and the etiology of disease—trauma and heart disease—trauma and peripheral vascular disease—trauma and pulmonary diseases—trauma and disease of the gastro-intestinal tract—trauma and genito-urinary diseases—trauma in relation to obstetric and gynecologic conditions—trauma and mental disorders—trauma and neurosyphilis—trauma and diseases of the nervous system—trauma and bone diseases—trauma and chronic diseases of the joints—trauma and diseases of the spine—trauma and neoplasms—trauma and diabetes—trauma and diseases of the thyroid gland—and trauma and septicemia.

It is scarcely necessary to say that this book should be on the shelves of every practicing physician and surgeon, and that it is of especial importance to industrial physicians and surgeons.

The book contains 613 pages, a generous bibliography at the end of each chapter, and a subject and author index. It was published by Lea & Febiger, Philadelphia, in 1937, and is priced at $7.50.

Laboratory Diagnosis of Syphilis

AT A TIME when the subject of syphilis has probably reached its highest interest, not only within the medical profession, but also in reference to the general public, a book on the above subject by DR. HARRY EAGLE, of the United States Public Health Service, meets with great favor by the medical profession generally.

The author's words convey an impression which is superior to any words the reviewer may use: "As the title of the book implies, I have attempted to make it more than a laboratory manual for the technician. An intelligent interpretation of the laboratory report by the physician is impossible unless he is familiar with the numerous sources of error inherent in the technic, and unless he is further aware of the exact significance of positive, negative, doubtful, partial, anticomplementary or conflicting reports. Our ideas as to the incidence of false positive reactions in the absence of syphilitic infection require radical revision, and it is important that certain misconceptions as to the significance of the spinal fluid findings be corrected."

The material in the book is divided into several

parts, Part I treating of the Wassermann reaction —Part II of the flocculation tests for syphilis— Part III of the examination of the spinal fluid— Part IV of tests for syphilis other than the Wassermann reaction or the flocculation of tissue lipoid—Part V the clinical evaluation of the serologic report—and Part VI the statistical comparison of serologic technic and the method of choice.

Useful material is also to be found in the appendix, consisting of zone reactions—outline of the daily routine in a large Wassermann laboratory—Wassermann tests on body fluids other than serum: the value of the "local" Wassermann reaction with chancre fluid—the combined Wassermann-flocculation technic—and pressing problems in the serodiagnosis of syphilis. An enormous list of references, which, however, are all made use of in the text material, is given at the back of the book.

Besides being of value to laboratory technicians, certain portions of the book will be invaluable to the practicing physician and surgeon because of the excellent treatment of the material in reference to the interprtation of laboratory reports, and the complicated factors which lie behind decisions rendered in such reports.

The book has 440 pages, is replete with diagrams and photographs, and was published by the C. V. Mosby Company, St. Louis, Missouri, in 1937. It is priced at $5.00.

The Environment and its Effect Upon Man

AS THE Harvard School of Public Health contribution to the celebration of the Harvard Tercentenary during 1936, a symposium on "The Environment and Its Effect upon Man," was held at the Harvard School of Public Health, Boston, August 24-29, 1936.

The papers and lectures given at this symposium have been gathered together in one volume and comprise a very notable contribution to the subject, ranging through such diverse fields as sociology and toxicology.

The complete list of papers and speakers is quite impressive: "The Effects of Social Environment," by LAWRANCE J. HENDERSON and ELTON MAYO; "Industrial Fatigue," by D. B. BILL, A. V. BOCK, H. T. EDWARDS and P. H. KENNEDY; "Air-Borne Infection," by H. D. CHOPE and W. G. SMILLIE; "Air-Borne Infection and Sanitary Control," by WILLIAM FIRTH WELLS and MILDRED WEEKS WELLS; "The Effects of Heat and Humidity upon the Human Body," by CECIL K. DRINKER; "Abnormal Air Conditions in Industry: Their Effects on Workers and Methods of Control," by C. P. YAGLOU; "The Physiological Effects of High Pressures," by LOUIS A. SHAW; "Industrial Operations in Compressed Air," by OLE SINGSTAD; "Carbon Monoxide Poisoning," by CECIL K. DRINKER; "Toxic Organic Vapors and Gases," by JOHN H. FOULGER; "Toxic Dusts and Fumes," by LAWRENCE T. FAIRHALL; "The Causation of Pneumoconiosis," by PHILIP DRINKER; "Clinical Aspects, Diagnosis and Treatment of Pneumoconiosis," by W. IRVING CLARK; "Design of Exhaust Hoods for Dust-Control Systems," by THEODORE HATCH; "Respiratory Protective Devices," by CARLETON E. BROWN; "The Application of Air Conditioning in Normal Life," by PHILIP DRINKER; "Hospital Air Conditioning," by C. P. YAGLOU; "A Laboratory of Industrial Toxicology," by W. F. VON OETTINGEN; and "The Industrial Hygiene Laboratory," by WARREN A. COOK.

Previously, a synopsis of these papers was published in proceedings form in INDUSTRIAL MEDICINE.

These papers and lectures represent the most important collection of information relative to medical, engineering and sociological aspects of man's environment and should, in addition to the technical points, which are of value, be a part of every library on general culture. Copies may be obtained from the limited supply available from the Editors of *The Journal of Industrial Hygiene and Toxicology*, 55 Shattuck St., Boston.

Diseases of the Nails

IN THIS rather small monograph by DR. V. PARDO-CASTELLO, of Havana, with foreword by DR. HOWARD FOX, Professor of Dermatology and Syphilology of New York University, is a surprising amount of information on a subject rather obscure to most practicing physicians and surgeons.

The subject matter of the book is divided into the anatomy and histology of the nails; pathology of the nails; affections peculiar to the nails, onychodystrophies; ungueal manifestations of dermatoses and of systemic diseases; congenital affections of the nails; the roentgen ray treatment of diseases of the nails; and in the addendum, material on occupations in which diseases of the nails are common and ungueal symptoms due to poisons.

The author has supplied 94 well-chosen illustrations which are very helpful in accurately visualizing the statements made in the text.

In addition to the subject index, there are 177 references which give an excellent survey of the literature on this subject. The volume should have a special interest to all practicing physicians and surgeons, but most particularly for dermatologists and those physicians and surgeons in industry interested in occupational effects.

The book contains 177 pages, was published in 1936 by Charles C. Thomas, Springfield, Illinois, and is priced at $3.50.

American Medicine— Testimony out of Court

THIS two-volume report totalling over 1,400 pages is the result of an investigation begun two years ago by the American Foundation of New York City.

The previous work of the Foundation, of which CURTIS BOK is the Chairman, was centered mainly around the field of international law and international relations with specific interest in the judicial settlement of international disputes during the period 1924-1935.

The contents of the book fall very largely into the following headings: Is adequate medical care now generally available?—Views on the general principles and considerations that should

underlie the organization of medical care—Medical education—Specialization—Group practice—The place of the hospital in the organization of medical care—Public health organization—Experimentation, state, county and community plans—State medicine—Health insurance—Limited state medicine and private practice. The material in the appendix embraces discussions of letters of inquiry, certifying boards, approved industrial services, and a long list of contributors. Of these contributors, there were general practitioners and family physicians, specialists, professors in teaching hospitals, deans of medical schools, research directors and laboratory workers, partners in group clinics, directors of public health work, members of the National Board of Medical Examiners, as well as certifying boards and state registration boards in medicine, and finally, officers of national, state, or local medical societies.

Adequately to review these two volumes would require a great deal of space and then it is doubtful whether one could form a real opinion as to the usefulness of the material—that must be left to personal opinion. However, the report divides itself somewhat naturally into about 11 sections, the first seven presenting present trends in medical practice and in medical education, attempting to state what is wrong and what is right with American medicine today; while the last four sections discuss different proposals, involving social and economic theories and principles, as well as medical, for the so-called "distribution" of medical care, the lowering of cost, and the feasibility of organizing medical care in public health services.

A great deal of the material is made up of personal opinions of all types of physicians who express themselves rather freely and openly on the many ramifications of this broad subject.

There are no recommendations made in the report, but it does represent a profound analysis of the whole structure of American medicine, raising questions in discussions rather than in answers of considerable immediate interest. There are, in fact, various answers to any one question and, as indicated before in this review, the reader himself must weigh and choose in finding the correct answer.

Of particular importance to industrial physicians and surgeons will be the various opinions as rendered by different practitioners regarding points both for and against industrial group practice. Interesting also will be the list of industrial medical services as approved by the American College of Surgeons and set down geographically, by states. It is likely that many industrial physicians and surgeons of high reputation who have made this field their life work will differ in the matter of classifying the statements regarding industrial group medicine under the general heading of "health insurance."

The report represents a tremendous amount of work and the gathering of opinions in two volumes from an endless variety of sources. As a source book, it will probably be of considerable value to any practicing physician or any physician whose relationships lead him to consider socio-economic changes—and this means every member of the medical profession.

The two volumes contain 1,435 pages, are published by the American Foundation, 565 Fifth Avenue, New York, 1937, and are priced at $3.50.

Method of Syphilis Control

—*In Industry*—

H. A. Vonachen, B.S., M.D.,
Medical Director, Caterpillar Tractor Co., Peoria, Illinois

SINCE the advent of the campaign instituted by the United States Public Health Department for the control of syphilis, and the education of the public in dealing with the prevention and treatment of this disease, industry has been confronted with another problem which to date has not been ideally solved.

Because of the fact that industrial medicine has advanced so remarkably within the past few years, it would naturally be the desire of the medical departments of industry to cooperate with the United States Public Health Department in their campaign to eliminate, as far as is humanly possible, a disease which yearly extracts a toll of thousands of lives and millions of dollars. Recent statistics reveal that there are known cases of syphilis totalling 518,000 presenting themselves yearly for treatment, and that 10% of all the insane in our institutions are there because of a mental disability due to this dreaded disease. In 1933 there were 26,700 cases of general paresis under treatment in various institutions. These patients cost the taxpayers approximately $14,000,000 yearly, and the disease takes as its toll, 40,000 lives from syphilitic heart disease alone.

Considering these figures, it would naturally seem to those who wish to view the humanitarian angle of industry, that they should formulate some method which would help to decrease the number of individuals totally incapacitated and those who die yearly from syphilitic disease. With these thoughts in mind, approximately a year ago, in the Peoria industrial area a plan was formulated which will be presented with the understanding that it is not beyond criticism, and that there are many improvements that possibly could be made, but only after a few years of experience—not only our own experience, but also the experience of those who are now attempting to aid in the final solution of the problem.

WHEN an individual presents himself for employment, a pre-employment examination is made, and a routine Kahn test is taken and submitted to our own laboratory. If the report of the Kahn test is positive, the individual is so informed and requested to report to his family physician for a re-check, and if this coincides with the previous blood test, the individual is hired with the definite understanding that he must submit himself to his family physician, or to a venereal clinic, for treat-

ment, and continue treatment until such time as an agreement can be reached between the medical department and the attending physician that sufficient medication has been given. This case is then diaried for a six-months period, at which time, the family physician is consulted and asked for information as to the amount of treatment given to the individual. If it is then found that the individual has failed to avail himself of the opportunity to improve his physical condition, he is dismissed from the services of the company. If the individual has been receiving treatment, he is then diaried for another six months, after which time a further inquiry is made as to his condition and number of treatments.

No case is accepted for employment if there are signs that would indicate to the examiner that the individual is in a stage which would be detrimental to his fellow employees. There naturally will be some who will say that, in this plan, we are employing known syphilitics and subjecting their fellow employees to the possibility of contracting the disease. But it can readily be seen that in the past we have always employed syphilitics without knowledge of their condition, and when we consider that one out of every four individuals who have the disease has no knowledge of its presence, naturally it would be more advisable to know the employee's condition than to have him continue with the disease with no treatment and finally develop to the stage where he becomes a public charge.

To date, approximately 9,450 Kahn tests have been made, with positives amounting to approximately 4%. The vast majority of these cases have availed themselves of treatment, and are satisfied that had they not received the opportunity their families would have suffered, and realize that industry in accepting them is submitting a willing hand in their battle to overcome the disease. If the individual is refused employment because of his syphilis, he therefore will have no financial income, and he is unable from an economic standpoint to obtain the treatment needed for his cure or alleviation of the disease.

The least that can be said for this method, is that it is humanitarian; that certainly a great number of these individuals will be saved from public institutions and will be able to continue in maintaining their families and relieving the taxpayers of millions of dollars.

Heart Disease

—*As a Factor in Disability and Retirement*—

Wm. C. Stewart, M.D.,
Charleston, West Virginia

INDUSTRY in this country is beginning to be heart conscious.* This movement is in its infancy, but is growing fast. Its growth is due in part to an added interest in heart disease among Americans in general. There are other reasons however which concern more particularly the increasingly complex relation between employer and employee. There has for some time existed among most employers of labor a commendable concern for the health of the worker, which concern is no doubt motivated in part by the knowledge that in the long run it pays in dollars and cents.

Initial and periodic examinations are now commonplace and disability insurance, pension funds and retirement plans are matters which demand our daily attention. In all these it is apparent that the degenerative diseases play a large part and degenerative diseases of the heart will be found leading all the rest. It is for this reason that it may not be untimely to consider briefly the role which heart disease plays in disability and retirement.

Because the efficient functioning of the heart is the most vital physiological process which goes on in the human body, and because derangements of cardiac function are such serious matters, the heart naturally receives a prominent place in any consideration of disabling diseases. Since many diseases of the heart are the result of degenerative processes and respond poorly to treatment, they are intimately concerned with the matter of retirement. The decision as to when a cardiac disorder is disabling or warrants retirement is not always an easy matter. The importance of this decision cannot be over-emphasized. An unrecognized cardiac disturbance may subject the worker constantly to serious hazards. Seizures such as a Stokes-Adams attack may expose him to moving parts or other dangerous agents. His infirmity may handicap him so that he is unable to avoid dangers which ordinarily would present no peril. There is also a constant danger to others when those in key positions suffer with certain types of heart disease. That sudden death may come to those with coronary or luetic heart disease is axiomatic, and the possible tragic consequence of such an event among dispatchers, engineers and others needs no explanation. Last, but by no means least, is the matter of efficiency. The man who is suffering with angina pectoris or mild cardiac failure cannot do a satisfactory type of work.

How shall one decide then when a man is disabled temporarily and must take a rest, or permanently and must be retired? Before this question is dealt with, it is only fair to remark upon the frequency with which employees will withhold facts concerning their health. Disability is almost never welcomed and retirement, except in certain cases where liberal insurance plans are in force, is much feared, and men will frequently not admit their symptoms of disease. When this is not the case however, causes for disability can be separated into two groups. First is the group of those who have disabling symptoms such as anginal pain, severe dyspnea or unmistakable signs of cardiac failure. The disability of these individuals is immediately apparent to the physician and is generally readily admitted by the individual himself. The permanency of this disability and the potential fitness of this employee for further work become a matter of concern for the employer. This problem will be dealt with pres-

* Read at the Congress of Railway Surgeons, September 20, 1937, Chicago.

ently, but it is a fact that many employees are made unfit for work by cardiac conditions which are either producing no symptoms at all, or symptoms which are of a slight degree and not significant in the mind of the worker. The identification of these conditions is important as previously pointed out, because they may place the employer in jeopardy, they may endanger the lives of others and they often cause a pronounced lack of efficiency in the worker. Severe grades of hypertension fall in this group of cardiac conditions along with aneurysm of the aorta, coronary artery disease, a previous bout of cardiac failure and certain of the cardiac arrythmias. Any of these may, in the true sense of the word, be disabling, although not producing constantly present or readily apparent symptoms.

It is now perhaps proper to begin a consideration of the specific cardiac conditions which may produce disability or indicate that retirement is warranted. The ability to diagnose their presence is essential, of course, but from the standpoint of this discussion the diagnosis of cardiac disease is not considered as important as the question of prognosis. The prognosis in any given condition will depend upon a knowledge of the underlying pathology of the disease in question. With this knowledge at hand, one is much better able to evaluate the extent of the immediate disability and approximate the possible necessity of permanent retirement.

HYPERTENSION is probably the commonest condition met in relation to disability and retirement. As employees come up for periodic examination, especially those in the older age groups, this is often the item of major importance both to the examiner and to the employee to be examined. The employee realizes this and waits with fear and trembling for the verdict. Often we learn that he has been subjecting himself to severe purging by "salts" or has resorted to other methods calculated to reduce his hypertension. He realizes that in a blood pressure which is elevated too high, lies disability and perhaps retirement. His company realizes this also, probably with the possibility of cerebral hemorrhage or cardiac failure in mind. Granting then that hypertension, unaccompanied by symptoms, may at times warrant retirement or a period of disability, on what basis is this decision to be made? It is certain that if arbitrary limits are laid down concerning what is and is not an accepted blood pressure, an injustice will be done in many cases. Some will feel that any systolic pressure of over 180 mm. of mercury indicates that a temporary period of rest is advisable, and that retirement should be seriously considered. Others may select a higher or lower figure as the proper one. The diastolic pressure in the meantime may have been more or less forgotten, but in reality points much more reliably toward the truth in this matter. It is less subject to fluctuation and gives a better idea of the load which the circulation is carrying. A diastolic pressure of 100 mm. of mercury is a hypertension, one of 110 mm. indicates that unless intercurrent disease prevents it, heart disease or cerebral hemorrhage will ultimately supervene, and a diastolic pressure of 120 mm. probably indicates that retirement is in order. The above figures might be considered just for those doing manual labor or working in operating positions of responsibility. However, it would not be fair to apply the same standards to those in clerical positions. In this connection, nothing is proved by isolated cases of individuals who have done good work for years with almost unbelievable blood pressures. It is true that a pressure of 190 systolic over 110 diastolic has not the same significance in every case. Those who seek the complete answer to this problem will do well to investigate the family history for the frequency of cerebral hemorrhage, inspect the eye grounds for hemorrhage or marked sclerotic changes, determine the heart size by some reliable method, and investigate the kidney function for early evidence of kidney damage. To determine the blood pressure of an indivdual at any given time is only a beginning. Hypertension of the essential type, that is, unaccompanied by evidence of renal involvement, is a benign disease and is not inconsistent with many years of useful activity. When renal damage and eye ground changes are present one can be sure that the hypertension is a malignant one and that a rapid downhill course can be expected. In the presence of a hypertension the most significant physical finding is that of the heart size. Excluding, for the time being coronary artery disease, any heart of normal size can be expected to function properly for many years despite the presence of hypertension. It becomes apparent that the taking of the blood pressure is merely a beginning and if the proper importance of any hypertension is to be determined other investigations must be made.

DISEASE of the coronary arteries is receiving more attention today than the cardiac disorder. The life-taking possibilities of this type of heart disease make it especially important in industry, for reasons previously mentioned. Angina pectoris is a result of inadequate blood flow through the coronary arteries, usually during exertion, and though this deficiency may at times be the result of coronary spasm, it is in general due to a sclerotic process. Since this pathological lesion does not respond to any known treatment, it is inevitably true that once the diagnosis of angina pectoria is made the possibilities for improvement are very limited. Those doing clerical or administrative work, especially if they have weight which can be lost, may continue comfortable and efficiently at work. But those who work with their hands can expect little relief. A common sequel to angina pectoris is coronary occlusion. The serious nature of this eventuality and the known frequence of its occurrence makes it likely that those suffering with angina pectoris should be retired, or at least shifted to less responsible and less arduous positions. Should coronary occlusion occur, whether there has been previous angina pectoris or not, a slightly different problem arises. The employee, of course, is immediately disabled

for many months. The prognosis is very uncertain. Knowledge as to the features of a coronary occlusion which point to a good result is developing fast. Prompt disappearance of the pain without recurrence, good compensation throughout without evidence of cardiac failure, maintenance of a reasonably slow pulse without gallop rhythm or pulsus alternans, no evidence of conduction defects in the electrocardiogram, and an early disappearance of abnormalities in the tracing with a return to normal, all give just cause for encouragement. But because manual labor may bring on cardiac failure in the damaged heart and because a second occlusion is almost certain to occur in time, those employees who have had a coronary occlusion are best retired except under unusual circumstances.

Hypertensive heart disease and coronary heart disease, as has been pointed out, achieve some of their importance as a factor in disability and retirement because of their frequent association with sudden, serious complications. Valvular heart disease is important almost entirely because of the symptoms of heart failure which it may produce, and dramatic complications are rare. Regardless of the type of valvular disease involved, the classical symptoms of congestive heart failure which ultimately result make it clear to the patient that he is disabled. If it be rheumatic valvular disease, the prospect for recovery from the first attack of heart failure is good, but valvular disease due to syphilis is likely to respond poorly to treatment. In either case, after one bout of decompensation, a second failure is very likely to develop if the patient undertakes manual labor for any length of time. It must be borne in mind however that functional heart murmurs are benign and must be recognized and segregated from those of an organic nature. Given a definitely organic murmur, the question arises as to the course to be followed. Stenosis of the mitral valve, except for the very slight degrees, is a very embarrassing cardiac lesion, and although often consistent with many years of fairly active life, is not compatible with manual labor. Aortic valvular lesions are the most trying of all those encountered. Aortic stenosis may be present for a number of years, but is apt to produce dizziness and periods of syncope. Aortic regurgitation, especially when due to syphilis, accounts for rapid cardiac hypertrophy and very soon a severe type of cardiac failure. Those suffering with this type of lesion are severely crippled. In summary, many heart murmurs are functional and consistent with strenuous activity. Mitral stenosis and aortic stenosis, especially if already responsible for appreciable cardiac enlargement, warrant a change to lighter work or retirement. Aortic regurgitation, especially the luetic variety, is a severe handicap and should permit retirement. Valvular disease is important because it, in time, produces cardiac failure, but it is not often responsible for dramatic or sudden complications.

Syphilitic aortitis may for the sake of this discussion be considered a cardiac lesion. This diagnosis is generally not made except by x-ray examination unless an aneurysm has developed. Simple aortitis may be responsible for such symptoms as dyspnea, sub-sternal pain or evidence of pulmonary congestion. It has been shown that if these patients are given a properly graded course of treatment a great deal may be accomplished for them, and they may be able to continue doing good work. If, however, any considerable amount of aneurysm has developed, the outlook for improvement is not good and these individuals should not be permitted in responsible positions.

PROBABLY the cardiac arrythmias are the most difficult of cardiac disturbances to properly evaluate. This is a large field, and time does not permit a detailed consideration of it. In general, the outlook in these cases is much more hopeful than the symptoms produced would lead one to suspect. Extra systoles, paroxysmal tachycardia and paroxysmal auricular fibrillation are more often than not functional disturbances, and while those suffering with them should be carefully scrutinized, their benign nature will ultimately become apparent. Chronic auricular fibrillation is more often associated with organic diseases, but experience in recent years has revealed that patients suffering with this disorder may do amazingly well. Many of these patients if properly treated will be found able to do several years of good work before cardiac failure supervenes. Transient heart-block, as manifested in the Stokes-Adams syndrome, generally is due to severe myocardial changes. Its importance is further enhanced by the fact that this syndrome is often associated with fainting or convulsive seizures. These individuals, continuing to work, produce a hazard for themselves and their fellow workers. Gallop rhythm and pulsus alternans are generally accompanied by other signs of a serious myocardial disorder. When they occur, one can be sure that the patient has a badly damaged heart.

In closing it should be pointed out that the cardiovascular system is sensitive to the condition of the nervous system. Cardiac neurosis and neurocirculatory asthenia are fairly common disturbances and may mimic organic disease very realistically. They add confusion to an already trying problem. One must be prepared to consider and weigh carefully all the evidence at hand. There are aspects of heart disease in relation to disability and retirement about which there will be controversy. But one is not qualified to take part in this controversy unless examinations have been thoroughly done and the findings scrutinized with more than just casual attention. In view of the confusion and difficulty associated with the detection and evaluation of the signs of heart disease, there is some question in my mind as to whether or not the average examiner is capable of handling this problem. I believe that in certain particular cases, there should be available consultants with the ability and facilities for doing further studies on the cases in which these seem indicated.

Industrial Medicine

Reg. U. S. Pat. Off.

The Journal of Traumatic Surgery and Occupational Diseases

Executive and Publication Offices
413 Pleasant Street, Beloit, Wis.

Eastern Offices
110 East 42nd St., New York City

Editorial Offices
540 No. Michigan Ave., Chicago, Ill.

CONSULTANT:
C. O. SAPPINGTON, M.D., DR.P.H.

MANAGING EDITOR:
A. D. CLOUD

EDITORS:
JAMES T. CASE, M.D., F.A.C.S.
VOLNEY S. CHENEY, M.D., F.A.C.S.
BRADLEY L. COLEY, M.D., F.A.C.S.
JOSEPH JORDAN ELLER, M.D.
HART E. FISHER, M.D., F.A.C.S.
JOHN G. FROST, M.D., F.A.C.S.
OTTO P. GEIER, M.D.
WILLIS W. LASHER, M.D., F.A.C.S.
WM. D. MCNALLY, M.D.
HORACE W. PORTER, M.D.
FREDERICK W. SLOBE, M.D., F.A.C.S.
E. A. VANDER VEER, M.D.

VOLUME 7 JANUARY, 1938 NUMBER 1

Things Definite

IMPRESSIVE among the principal events of the last 12 months was the tremendous upsurge of interest in occupational diseases, not only existing on the part of those primarily concerned, but also expressed in the numerous and important meetings and conferences held within the year. The interest was greater than ever before, and much more articulate. The result is, as DR. SAPPINGTON points out (page 23), "that objectives relating to occupational diseases in this country, have reached a high point in their achievement during 1937."

This is both a high point, and a solid one—for there is conviction now, where there was only hope even a few years ago, that this phase of the employer-employee relation is not going to outrun the physician and surgeon's part in it as did workmen's compensation. There was, of course, the difference between the two that the physician's place in the measures that would head off injuries was not so clearly defined as is his place in the preventive handling of occupational diseases. But that has been overcome, and the physician's cooperation with, as DR. LEVEN says, (page 37), "employees, officials of the companies that employ them, industrial commissions and boards, industrial engineers, and the judiciary," has grown to be an assured function of his industrial interests—and to some extent, the gauge of the grasp he must not relinquish upon the general and preventive aspects of occupational diseases. Where the compensation relations developed slowly, over long periods, the occupational disease relations must crystallize rapidly and in a short time—as, indeed, they are crystallizing, for the industrial medical man is meeting them as he would meet a challenge, and mastering them as rapidly as they become tangible.

We go into the new year, therefore, with industrial medicine alert, eager, and responsive.

THERE are a few carry-overs of indefiniteness. One is in the matter of definitions, particularly in respect of the "legal clarification of the definition of occupational disease." Industrial policies regarding venereal diseases ought to help clear this up. Industry cannot ignore them, nor can it be arbitrary in its handling of them. They are found among employees, and must be reckoned with, as DR. SAYERS so clearly points out. But they are not occupational diseases, and that very fact, observed on the wide scale of their prevalence among those who are gainfully occupied in industry, must inevitably emphasize the difference between a disease found among employees because of their employment and a disease found among employees because of things not part of their employment. The clear-cut contrast is apparent here, where it might not be so obvious with some other disease. The unmistakable definiteness of employee affections in this respect, can not fail to assist in a corresponding definiteness in other respects—and thence will come definition.

SYPHILIS and gonorrhea seem entirely outside of industrial compensability. But, as a matter of policy and economics (see DR. SAYERS, page 1), and as a matter of economics and humanitarianism (see DR. VONACHEN, page 41), they are within the range of industrial curability.

And strangely enough, the one place where industrial medical services are likely to find it necessary to involve themselves in curative endeavors which should be done by the employees' personal physicians is in connection with these diseases which do not have their origin or their incidence in any conditions for which industry can be held to blame. Thus, from DR. SAYERS' article: "there is a responsibility upon the industrial medical officer to see that adequate modern treatment is available to employees at prices ordinary wage-earners can afford. . . . if such is not otherwise available, the industrial medical service should itself undertake such treatment." If the medical department does this, therefore, it will be because it has to. Industrial medicine, however, is now strong enough and well enough organized to stand the criticism which will, no doubt, be the profession's reaction even though the circumstances which bring it forth will be also the profession's fault.

Occupational Diseases and Industrial Surgery

Healthy, Wealthy---if Wise---Industry

ALICE HAMILTON, M.D.*

THE history of industrial hygiene in the United States, of a deliberate effort to prevent occupational disease, is short, very short if it is compared with that of Britain, Germany, Austria, the Netherlands, Switzerland. Up to 30 years ago no study had ever been made in this country of the dangerous trades, no investigation into the occurrence of lead or arsenic or phosphorus or mercury poisoning in men who were necessarily exposed to some one of these poisons in the course of their daily work. The small group of medical men attached to industrial plants were surgeons whose first duty was to treat cases of accidental injury and protect the company from damage suits. Sickness arising from an occupation was not the comcern of the employer unless he happened to be one of those exceptional characters who look on themselves as their brothers' keepers. Even as late as 1911 it was possible for the manager of a great white lead works to exclaim with genuine indignation, "Do you mean to imply that if one of my men gets lead poisoning I am to be held responsible?"

Medical men were quite as ignorant and indifferent as employers. No articles on industrial poisoning appeared in medical journals or were presented at medical congresses. Physicians shared the optimistic attitude of the employing class; they believed that American workers were so much better paid than Europeans, better fed and housed, American mines, smelters and factories were so far superior to all others that the dangers menacing the foreign worker were negligible here.

The first blow to this happy security came when in 1909 John M. Andrews, now of the American Association for Labor Legislation, published the results of an investigation he had made for the Federal Bureau of Labor of phossy jaw in men and women making lucifer matches. Phossy jaw is caused by the penetration of phosphorus fumes through a decayed tooth, causing inflammation and necrosis of the jawbones. It is intensely painful and offensive and it results in permanent disfigurement, so that the victims are objects of horror and pity to everyone. There had been much agitation over this form of industrial poisoning in other countries but none here—indeed we believed that we were entirely free from it.

The history of our dealings with phosphorus poisoning in the match industry illustrates vividly the attitude of Americans toward industrial disease in this early period. The first case of phossy jaw ever recognized was reported from Vienna in 1845 and from then on it excited much discussion all over Continental Europe and England and every effort was made to control the danger. Finally, when prevention was proved impossible, the producing countries of Europe entered into an agreement which abolished the use of this kind of phosphorus and substituted the safe sesquisulphide. In the United States the first case came to light six years later, in 1851, but from then on practically nothing authentic on the subject was published in this country till Andrews' report came out in 1909.[1] When, however, the public learned that over 150 cases had occurred in American match manufacture it was fairly easy to induce Congress to pass the Esch law laying a tax on matches made with white phosphorus. This was soon followed by the adoption of the safe compound.

This is the simplest problem of industrial poisoning so far encountered and we can hardly hope to repeat the history of the freeing of the match industry from the danger of phossy jaw. Here was a poison used in one large industry only, of known action, producing injuries visible to everyone and rendered unnecessary by the discovery of a safe substitute. It is natural it should have been the first problem attacked; it was the simplest.

American industry before the War presented problems more complicated than this but they were relatively few in number. Industry at that time was characterized by a small number of dangerous processes involving the use of some few poisons which were well-known to physicians and industrialists in other countries but because of ignorance and indifference were inadequately dealt with over here. Many thousands of workers were exposed to dangers which could have been prevented by intelligent engineering practice. An occupational disease survey of Illinois, made in 1909-1910 and limited to the poisonous trades, revealed a very high rate of poisoning but a very short list of trade poisons — lead, arsenic, mercury, brass (zinc oxide fumes) carbon monoxide, turpentine.

The report of the survey, published in 1911, is really a record of a pioneer exploration, with few guides to show the way. For instance the enameling of bathtubs and sinks was then done with a mixture rich in lead but nobody outside the factories, not even factor inspectors or doctors, knew that it was a lead-using industry, and the fact was brought to light only when a search through hospital records disclosed a large number of cases of plumbism among grinders and enamelers. When an investigator secured a sample of the enamel from a workman who used to take it home for his wife to use in scouring pots and pans analysis showed the presence of soluble lead. Nothing in English or German literature had given any hint of this danger of enameling, for lead-free enamel is used over there, as it is now almost entirely in this country. The number of actual cases discovered in the Illinois survey necessarily fell far short of the truth, yet when the figures were compared with those of the same trades in England and Germany, figures recorded on the basis of regular examinations of all lead workers, the result was appalling. In one industry, the making of white lead and the oxides, a factory in England employing 150 had had two cases; one American employing only 142 men had had 25 known cases, and another with only 70 to 80 employed had had no less than 11 cases in two months, or (the labor turnover was very great) a rate of 66 a year. The form of lead poisoning was often very severe. Lead convulsions and lead insanity were rarities in England and Germany but there was a center of lead work in southwestern Illinois where everyone knew what "lead fits" were and it was easy to find cases.

This first period therefore is one of comparatively few, simple, well-understood problems; of general ignorance and indifference; of excessive incidence of occupational poisoning in a few industries, accepted as inevitable by employers and employed and by the few physicians who took any cognizance of it at all. The chief method of protection was to encourage a large labor turnover (so that no one worker would be exposed too long) which was not then regarded as poor industrial practice. Governmental control by state labor departments was practically non-existent and though the Federal Bureau of Labor had begun to make investigations of poisonous trades, the Public Health Service had never entered that field at all.

The War changed all this. With the shutting off of German imports there came a crying need for dyes and drugs for our own use and for acids and coal tar intermediates essential in the production of high explosives, since we began very early in the War to produce trinitrotoluene, smokeless powder and picric acid for the Allies. We had depended on Germany for these chemicals — we had, for instance, produced very little

---

* In *The American Scholar*, Winter, 1938, Vol. 7, No. 1, published quarterly by Phi Beta Kappa.

1. Andrews discovered a pamphlet by a New York doctor, published in 1851, which described nine case of phossy jaw in that city and also a article in the *New York Evening Post* of 1864, which told of 12 cases.

TEAR OUT this page and use it for an order---or just mail it for literature

HILLE LABORATORIES, INC.
1791 Howard St., Chicago, Ill.

Gentlemen: Kindly send:

QUANTITY	SIZE	DESCRIPTION PER UNIT	$	¢
	1 oz.	Armervenol (colloidal arsenic-mercury-copper-sulphide) (oral) $1.00		
	4 oz.	Armervenol (oral) 3.05		
	12 oz.	Armervenol (oral) 8.15		
	20 cc.	Armervenol (hypo) 1.50		
	60 cc.	Armervenol (hypo) 3.00		
	360 cc.	Armervenol (hypo) 15.00		
	1 oz.	Aurol (colloidal gold) (oral) 2.40		
	4 oz.	Aurol (oral) 7.20		
	12 oz.	Aurol (oral) 19.20		
	20 cc.	Aurol (hypo) 3.00		
	60 cc.	Aurol (hypo) 6.00		
	360 cc.	Aurol (hypo) 30.00		
	1 oz.	Mervenol (colloidal mercury-copper-sulphide) (oral) 1.00		
	4 oz.	Mervenol (oral) 3.05		
	12 oz.	Mervenol (oral) 8.15		
	20 cc.	Mervenol (hypo) 1.50		
	60 cc.	Mervenol (hypo) 3.00		
	360 cc.	Mervenol (hypo) 15.00		
	1 oz.	Colloidal Mercury Sulphide-Hille 1% (oral) 1.50		
	4 oz.	Colloidal Mercury Sulphide-Hille 1% (oral) 4.50		

QUANTITY	SIZE	DESCRIPTION PER UNIT	$	¢
	12 oz.	Colloidal Mercury Sulphide-Hille 1% (oral) 12.00		
	20 cc.	Colloidal Mercury Sulphide-Hille 2% (hypo) (sterile) 1.80		
	60 cc.	Colloidal Mercury Sulphide-Hille 2% (hypo) (sterile) 3.60		
	360 cc.	Colloidal Mercury Sulphide-Hille 2% (hypo) (sterile) 18.00		
	1 oz.	Luncsol (Colloidal silver chloride comp.) antiseptic, germicide 1.80		
	4 oz.	Luncsol 6.00		
	16 oz	Luncsol 21.60		
	1 oz.	Zinc Borate (Hille) with Ephedrine 1.15		
	4 oz.	Zinc Borate (Hille) with Ephedrine 3.45		
	12 oz.	Zinc Borate (Hille) with Ephedrine 9.15		
	1 oz.	Zinc Borate (Hille) 1.00		
	4 oz.	Zinc Borate (Hille) 3.00		
	12 oz.	Zinc Borate (Hille) 8.00		
	30 cc.	Bismo-Rhodanol (colloidal bismuth oxysulphocyanide. 2% Bi.) sterile 3.00		
	100 cc.	Bismo-Rhodanol, 2% Bi., sterile 7.50		
	12 oz.	Biosol (colloidal iron, etc.) .. 1.20		
		TOTAL $		

PLEASE *send items indicated* POSTPAID

IM-1-38

☐ I enclose check for total, with 2% deducted for cash.

☐ Send above C.O.D., postpaid. ☐ Send and bill to our company.

☐ Send literature on .....

Doctor .....

Name of firm .....

Address .....

Town ..... State .....

THE AMERICAN ASSOCIATION
of
INDUSTRIAL PHYSICIANS and SURGEONS

Component Societies

Central States Society of Industrial Medicine & Surgery

Association for the Advancement of Industrial Medicine & Surgery

THE object of this Association shall be to foster the study and discussion of the problems peculiar to the practice of industrial medicine and surgery; to develop methods adapted to the conservation of health among workers in the industries; to promote a more general understanding of the purposes and results of the medical care of employees, and to unite into one organization members of the medical profession specializing in industrial medicine and surgery for the mutual advancement in the practice of their profession.

OFFICERS

President: Dr. Royd R. Sayers,
U. S. Public Health Service, Washington, D. C.

President-elect: Dr. Clarence D. Selby,
General Motors, Detroit, Michigan

1st Vice-Pres.: Dr. McIver Woody,
Standard Oil Co., New York City

2nd Vice-Pres.: Dr. Daniel L. Lynch,
New England Telephone & Telegraph Co.,
Boston, Mass.

Sec'y-Treas.: Dr. Volney S. Cheney,
Armour & Company, Chicago

DIRECTORS

1936-1938

Dr. Floyd E. Shaffer,
Bethlehem Steel Co.,
Sparrows Point, Md.

Dr. John J. Wittmer,
4 Irving Place, New York City

Dr. George H. Gehrmann,
Du Pont Company,
Wilmington, Del.

Dr. Thurman H. Lautenschlager,
Dayton Industrial Surgery,
Dayton, Ohio

Dr. Archibald W. George,
Packard Motor Car Co.,
Detroit, Mich.

Dr. Loyal A. Shoudy,
Bethlehem Steel Co.,
Bethlehem, Penna.

1937-1939

Dr. Alfred H. Whittaker,
Insurance Companies,
Detroit, Mich.

Dr. Edward C. Holmblad,
Railway Express Agency,
Chicago, Ill.

Dr. Robert P. Knapp,
Cheney Brothers,
South Manchester, Conn.

Dr. Otto P. Geier,
Cincinnati Milling Machine Co.
Cincinnati, Ohio

Dr. Andrew M. Harvey,
Crane Company, Chicago, Ill.

Dr. C. F. N. Schram,
Tennessee Eastman Corp.,
Kingsport, Tenn.

PROGRAM COMMITTEE

Edward C. Holmblad, M.D., *Chairman*
Volney S. Cheney, M.D.
Andrew M. Harvey, M.D.
Wm. D. McNally, M.D.
Clarence O. Sappington, M.D.
Fred W. Slobe, M.D.
Frank P. Hammond, M.D.

ANNUAL MEETING

THE 1938 Annual Meeting of the American Association of Industrial Physicians and Surgeons, and the 1938 Midwest Conference on Occupational Diseases, will be held at the Palmer House, Chicago, June 6, 7, 8 and 9, 1938.

benzol (the starting base for most of them), using the petroleum solvents, naphtha and benzine, instead. What benzol we needed we had bought from Germany and had allowed that valuable solvent, together with the closely allied toluol and xylol, to pass off into the air from the coke ovens which used to line the railways through the coal regions of Pennsylvania. But since benzol and toluol are essential starters for the manufacture of dyes and drugs and for many of the high explosives, coke by-products plants began to spring up. Aniline, needed for dyes and at that time the most important accelerator of rubber vulcanization, is a reduction derivative of nitrobenzol. We had bought it also from Germany but after August, 1914, plants were hastily constructed for nitration and reduction. Since nitric acid is essential to the manufacture of aniline and for all high explosives the demand for it increased enormously. Although we had never made more than a small quantity before the War, by the early Spring of 1916 a single plant of the Du Pont Company was employing some 12,000 men in nitrating cotton for the Allies.

All this new development meant new problems for engineers and, since their first task is to produce, regardless of danger to themselves or their fellow-workers, there were serious accidents in those early days, resulting in the escape of poisonous vapors or fluids, and frequent repair jobs which usually mean excessive exposure for the repair gangs. Moreover many of the compounds, whose production had increased so much, are themselves poisonous and their use—in rubber compounding, in loading shells and mines, in making dyes—meant new dangers to the workers. In those days one could go into a plant producing intermediates and find all the aniline reduction units out of commission, the floor awash with aniline and water and the men more or less soaked with the mixture—and aniline oil is one of the poisons that enter very easily through the skin. It was possible to visit a cotton nitration plant and in the course of one day witness no less than eight out-pourings of poisonous nitrous fumes, the men fleeing before them into the open but not always quickly enough. Nitrous fumes cause acute congestion of the lungs followed by edema or by pneumonia.

At that time engineering practice had not nearly caught up with the problems it had to deal with if workers were to be protected against such dangers nor was there much inducement to put forth efforts in that direction. Employers were absorbed in large-scale production with its attendant huge profits, workmen were getting high wages, organized labor was quite indifferent to the lot of the unskilled men who made up the working force in these industries and factory inspectors were bewildered and powerless. Our record in this

field is not a matter for national pride. Faced with an emergency far less overwhelming than that confronting France and Britain we refused to adopt the protective measures which they had worked out, giving a free hand instead to the reckless and indifferent manufacturer. In spite of all the efforts of an advisory committee of physicians no code of safe practices was ever adopted. Only in the Spring of 1919 did Samuel Gompers triumphantly produce a code, less stringent than the English, lacking any compulsory feature and adopted months after the Armistice.

Nevertheless the War not only increased the dangers in American industry; it also aroused the interest of physicians in industrial poisons. And that interest has never died down. On the contrary it has increased with the increasing complexity of methods of manufacture. A change took place also in the attitude of employers, for a large labor turnover was found to be not only wasteful but an unsatisfactory method of dealing with dangerous processes in industry. The Public Health Service had entered this field during the War and the medical journals had published articles discussing the action of the new poisons and various methods of preventing danger from the old ones. In the period following the War we find very rapid progress in the control of the poisonous trades. To a great extent this improvement is traceable to the passage, by some of the more important industrial states, of legislation awarding compensation for industrial disease and to the consequent pressure from insurance companies; but in part it has come from a new enlightenment on the part of employers and their recognition of responsibility for occupational sickness among their employees. We find it sometimes even in those states which have passed no protective legislation.

But though the poisons with which we are familiar have been brought largely under control, industry is facing much more complicated problems in connection with the new chemicals that are crowding in and whose action on man is sometimes quite unknown. Let me give a few instances out of the many that might be cited. In spinning and weaving cotton, silk, wool, and linen the unhealthful features are humidity (often with heat), dust (but of a relatively harmless character) and fatigue. The high rate of tuberculosis among textile workers, as among tobacco workers, is attributed to their low wages. These textiles, however, have been largely displaced by artificial silk, rayon, acetate, Bemberg. The last does not require the use of poisonous chemicals, acetate silk uses comparatively safe ones, but rayon, by far the most important, calls for carbon disulphide, which is poisonous to the central nervous system, causing neuritis, paralyses, insanity and loss of vision. Few physicians in this

AMERICAN ASSOCIATION
of
RAILWAY SURGEONS

1937 - 1938

Officers

President ..... HARVEY BARTLE, M.D., Philadelphia, Penn.
Vice-President ..... FRANK DINNEN, M.D., Cleveland, Ohio.
JOHN HAYDEN, M.D., Kansas City, Mo.
WILLIS C. CAMPBELL, M.D., Memphis, Tenn.
Treasurer ..... T. L. HANSEN, M.D., Chicago, Ill.
Secretary ..... D. B. MOSS, M.D., Chicago, Ill.
(Phone WABash 2345)

Executive Board

G. G. DOWDALL, M.D. ..... Chicago, Ill.
JOHN R. NILLSON, M.D. ..... Omaha, Nebr.
J. G. FROST, M.D. ..... Chicago, Ill.
A. R. METZ, M.D. ..... Chicago, Ill.
W. J. LANCASTER, M.D. ..... Wilmington, N. C.
W. A. MCMILLEN, M.D. ..... Charleston, W. Va.

ASSOCIATION OF SURGEONS
OF THE
NEW YORK CENTRAL SYSTEM

OFFICERS

President:
H. G. FARMER, M.D.
Vice-Presidents:
R. R. RYAN, M.D.
C. E. CASE, M.D.
B. J. LARKIN, M.D.
J. B. BRADLEY, M.D.

Secretary-Treasurer:
H. A. FATHAUER
Office of Secretary-Treasurer
413 LaSalle Street Station,
Chicago, Illinois.
Telephone WABash 4200

EXECUTIVE COMMITTEE

B. L. COLEY, M.D., F.A.C.S.
Chief Surgeon, New York City
L. A. ENSMINGER, M.D., F.A.C.S.
Chief Surgeon, Indianapolis
H. A. FATHAUER,
Secretary-Treasurer
GEORGE P. MYERS, M.D., F.A.C.S.
Medical Director, Detroit
F. E. PIERCE, M.D., F.A.C.S.
Chief Surgeon, Chicago.
S. B. TAYLOR, M.D., F.A.C.S.
Chief Surgeon, Columbus
G. R. WINTERS, M.D., F.A.C.S.
Chief Surgeon, Pittsburgh

OLIVER G. BROWNE, General Claims Attorney

ASSOCIATION OF SURGEONS
OF THE
SOUTHERN RAILWAY SYSTEM

OFFICERS

President:
W. S. AUSTIN, M.D.
1st Vice-President:
W. H. FRAMPTON, M.D.,
Charleston, S. C.
2nd Vice-President:
J. H. ALLAN, M.D.,
Rutherford, Tenn.
3rd Vice-President:
D. S. MIDDLETON, M.D.,
Rising Farm, Ga.
4th Vice-President:
F. W. GRIFFITH, M.D.,
Asheville, N. C.

Treasurer:
EDITH A. FOLTZ,
Office of Treasurer
Railway Building,
Washington, D.C.
Recording Secretary:
W. W. HARPER, M.D.,
Selma, Ala.
Asst. Recording Secretary:
W. H. BLAKE, M.D.,
Sheffield, Ala.

GLENN I. JONES, M.D., Chief Surgeon,
Washington, D.C.

The Industrial Doctor

OFFICIAL SECTION OF THE NEW YORK STATE SOCIETY OF INDUSTRIAL MEDICINE

Published under supervision of the Ways and Means Committee of the New York State Society of Industrial Medicine. Editorial office, F. E. Redmond, Managing Editor, 361 Delaware Avenue, Buffalo, N. Y. Articles appearing herein do not necessarily reflect the opinion or policy of this journal nor of the New York State Society of Industrial Medicine.

Editorial Board

B. J. Slater, M.D.
E. T. Wentworth, M.D.
M. S. Bloom, M.D.
A. R. Grant, M.D.
Raymond C. Almy, M.D.
Paul B. Jenkins, M.D.
Willis C. Templer, M.D.
Chas. P. Hutchins, M.D.
P. L. Forster, M.D.
A. M. Dickinson, M.D.
Chas. D. Squires, M.D.
Richard S. Farr, M.D.
C. W. Woodall, M.D.
Francis J. Ryan, M.D.
M. W. Stofer, M.D.
D. C. O'Connor, M.D.
F. N. C. Jerauld, M.D.
E. MacD. Stanton, M.D.
E. A. VanderVeer, M.D.
H. H. Baker, M.D.
R. E. Fenner, M.D.
O. A. Brenenstuhl, M.D.,
John L. Norris, M.D.,

Frank E. Redmond, *Managing Editor*
361 Delaware Ave., Buffalo, New York

The New York State Society of Industrial Medicine

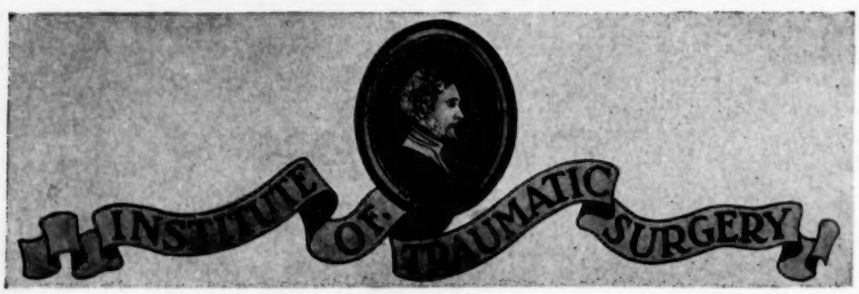
Officers

E. A. Vander Veer, M.D.
President
Paul B. Jenkins, M.D.
1st. Vice-President
A. R. Grant, M.D.
2nd Vice-President
Raymond C. Almy, M.D.
Treasurer
Frank E. Redmond, *Executive Secretary*

Directors

Dr. Raymond C. Almy, Auburn
Columbia Rope Co.
Dr. H. H. Baker, Rochester
423 Granite Bldg.
Dr. O. A. Brenenstuhl,
Albany
Dr. R. E. Fenner, Syracuse
433 S. Salina St.
Dr. Philip L. Forster, Albany
363 State St.
Dr. A. R. Grant, Utica
321 Genesee St.
Dr. Chas. D. Squires, Binghamton
28 Conklin Ave.
Dr. Willis C. Templer, Corning
Corning Glass Works
Dr. C. P. Hutchins, Syracuse
Aetna Life Insurance Company
Dr. Francis J. Ryan, Syracuse
New York State Railways
Dr. B. J. Slater, Rochester
Eastman Kodak Company
Dr. A. M. Dickinson, Albany
New York Central R. R.
Dr. Edw. T. Wentworth, Rochester
Dr. M. W. Stofer, Norwich
Norwich Pharmacal Company
Dr. M. S. Bloom, Binghamton
Dunn & McCarthy
Dr. E. MacD. Stanton, Schenectady
American Locomotive Company
Dr. F. N. C. Jerauld, Niagara Falls
Dr. Donald C. O'Connor, Buffalo
International Railways
American Radiator Co.
Dr. Richard S. Farr, Syracuse
Consulting Orthopedist
Dr. C. W. Woodall, Schenectady
146 Barrett St.
Dr. John L. Norris,
Rochester

1938 Annual Meeting at Albany, New York



OFFICERS

Chairman of the Board: Frank P. Hammond, M.D., F.A.C.S.
6308 Cottage Grove Ave., Chicago.

President: Kellogg Speed, M.D., F.A.C.S.,
122 South Michigan, Chicago.

Vice-President: Edward C. Holmblad, M.D., F.A.C.S.
28 East Jackson Blvd., Chicago.

Secretary-Treasurer: John D. Ellis, M.D., F.A.C.S.,
122 S. Michigan Ave., Chicago.

BOARD OF GOVERNORS

Harry E. Mock, M.D., F.A.C.S.,
R. A. Jacobson, M.D. W. F. Lyon, M.D.

country have ever heard of this poison or have any idea of its action, although foreign medical literature is full of reports of cases occurring in rayon plants. Sulphuretted hydrogen, an old poison, well known as rapidly fatal if present in large quantities, adds another hazard to the production of rayon. Most physicians do not know, however, that small quantities in the air will cause severe inflammation of the eyes.

The solvent used for gums and rubber, for degreasing machinery, for dry cleaning, etc., was formerly petroleum naphtha or benzine or gasoline, all weak narcotics. Added to these we now find members of the chloroform group, resembling chloroform but differing from it and from each other in ways that still are only partially understood. The paints' trade used to involve exposure to lead and turpentine, the paint being applied by brush. Now the brush has been displaced by the spray gun and the painter works in a mist of volatile solvents of nitrocellulose that are sometimes almost harmless but that usually include at least one toxic compound. The trouble is that these solvent mixtures change each year, with chemicals coming into use before they have been thoroughly tested.

These are only a few examples of the ways in which occupations have changed their character in recent years. And though the problems of industrial hygiene have become much more numerous and more difficult, the efforts to deal with them have multiplied many times. The Public Health Service and the Division of Labor Standards in the Department of Labor are deeply interested in industrial disease (the Service devotes one whole department to research—both laboratory tests on animals of the action of suspected compounds, and field studies of thousands of workers exposed to dangerous dusts); several of the large medical schools are carrying on the same sort of work; an organization of industrial physicians and surgeons, a branch of the American Medical Association, and at least three journals are devoted to industrial medicine; the companies which offer industrial insurance, notably the Metropolitan Life, cooperate in studying the effects of dusts and poisons on workers; the attitude of many employers has changed from one of secrecy and hostility to a frank facing of facts and a genuine desire to deal with them; and finally (though this should probably hold first place) all the important industrial states now provide compensation for occupational disease, Michigan and Pennsylvania having at long last joined their more progressive fellows. Among the many post-war incidents that might be used to show this changed attitude toward the dangers in industry two are especially striking.

In 1923-24 newspapers carried stories of a number of cases of severe

poisoning from exposure to a new poison, tetra-ethyl lead, which was being produced by one large company and used by several for blending with gasoline. This is a very dangerous form of lead, is more quickly absorbed than any of those ordinarily used in industry, and concentrated in the central nervous system, causing insomnia, excitement, twitching muscles, hallucinations like those of delirium tremens, even maniacal attacks and convulsions, and death. The *New York World* took up the crusade aganist this dangerous poison, there was widespread panic lest the use of the blended gasoline involve risk to the public, several states hastily prohibited the sale of "ethyl gasoline" and foreign countries threatened to forbid its import. The emergency was met by Surgeon General Cumming who called a conference in May, 1925, at which industrialists, chemists, labor representatives and physicians agreed to entrust the problem to a small group of experts who should decide on the nature of the danger and on whether prohibition or control was needed. Meantime the manufacturers promised not to sell ethyl gasoline until the report of the experts had been made. The committee found that the hazard to producers and blenders could be wholly prevented by mechanical devices and that the danger to garage workers was slight and to users none at all unless gasoline was used for cleaning textiles. To obviate this small element of risk warnings were to be put on all supply pipes and the blended gasoline colored.

Another instance, very similar to this, occurred in connection with the making of luminous figures on watches and clocks. Here too a new, almost unknown poison was involved, radium (using this in the sense of radioactive bodies), the effects of the poison were peculiarly terrible, the public was aroused by newspaper stories of women dying after months of suffering (again it was the *New York World* that led the crusade) and a demand was made for some governmental action. This was provided by the same method (a conference called by the Surgeon General), an expert committee was appointed and the manufacturers voluntarily pledged themselves to abide by its decision. In connection with both ethyl gasoline and luminous paint close watch is still kept to detect possible cases but the precautions worked out in these occupations seem thus far to be so adequate that we do not fear any serious injury to the people employed in them.

These are good examples of the new system we are developing in this country, where control of the dangers in industry is divided among 48 states and compulsory regulation would be practically impossible to put through. The Public Health Service and the Department of Labor have no real authority yet their influence, together with the publicity

Alparene Hernial Proliferant

A product of Research

A highly effective, self-sterilizing colloidal solution, producing a firm, dense fibrosis and tautening of the inguinal structures.

Write for Literature

DEQUIN PHYSICIANS PRODUCTS CO.
75 East Wacker Drive, CHICAGO, ILLINOIS

Behind Mercurochrome

(dibrom-oxymercuri-fluorescein-sodium)
H.W.&D. *is a background of*

Precise manufacturing methods insuring uniformity

Controlled laboratory investigation

Chemical and biological control of each lot produced

Extensive clinical application

Thirteen years' acceptance by the Council of Pharmacy and Chemistry of the American Medical Association

A booklet summarizing the important reports on Mercurochrome and describing its various uses will be sent on request.

HYNSON, WESTCOTT & DUNNING, Inc., Baltimore

Michigan Association of Industrial Physicians and Surgeons

Officers

PRESIDENT — A. H. WHITTAKER, M.D., F.A.C.S. Detroit
VICE-PRESIDENT — LEON SEVEY, M.D. Grand Rapids
SECRETARY-TREASURER — DON F. KUDNER, M.D., F.A.C.S. Jackson

Board of Directors

L. H. CHILDS, M.D. — Flint
CARL E. BADGELY, M.D., F.A.C.S. — Ann Arbor
HENRY J. PYLE, M.D. — Grand Rapids

The Association for the Advancement of Industrial Medicine and Surgery

Inc.

Executive Office - 370 Lexington Avenue, N. Y. (Room 904)

PURPOSE: *To disseminate accurate medical knowledge in reference to the diagnosis and treatment of all conditions arising out of and in the course of employment.*

OFFICERS

President:
J. J. WITTMER, M.D.
4 Irving Place,
New York City

Recording Secretary:
DAVID SHAPIRO, M. D.
41 East 42nd St.,
New York City

Vice-President:
FRED H. ALBEE, M. D., F.A.C.S.
57 West 57th St.,
New York City

Treasurer:
JOSEPH L. RAMIREZ, M. D.
30 Fifth Ave.,
New York City

Executive Secretary:
J. J. BLACKFORD, 370 Lexington Ave., New York City
(CAledonia 5-9753)
Robert F. Coleman, Inc.

EXECUTIVE COUNCIL

DR. J. HUDSON BLAU'ELT ..... Fidelity & Casualty Insurance Co.
DR. T. WALLIS DAVIS ..... Borden Company
DR. LYLE ELLIS ..... Travelers Insurance Co.
DR. HALCYON HALSTEAD ..... Globe Insurance Co.
DR. BURKE C. HAMILTON ..... Aetna Life Insurance Co.
DR. GEORGE A. KOENIG ..... National Biscuit Co.
DR. WILLIS W. LASHER ..... Employers Liability Insurance Co.
DR. FREDERICK L. MOSSER ..... Third Ave. Ry. & Bus Lines
DR. ARTHUR R. TILTON ..... Travelers Insurance Co.

DUST IN INDUSTRY — What the hazards are; how to determine their existence; how to combat them.

INDUSTRIAL DUST

Hygienic Significance, Measurement and Control

By Philip Drinker *and* Theodore Hatch
Harvard School of Public Health
316 pages, 6x9, 104 illustrations.

$4.00 Plus Postage

This book covers the problem of dust control in its relation to the health of workmen, emphasizing the cooperative nature of the problem both for physicians and engineers, and presenting principles, methods and data for the design and operation of dust-control equipment. It discusses the physical aspects of dust and fume suspensions and their effect upon man; the analysis, measurement, and microscopy of fine dusts; and the practical control of dusts and use of respiratory protective devices.

INDUSTRIAL MEDICINE
540 No. Michigan Ave.,
Chicago, Illinois.

they can command, is very powerful. In both these cases pressure was brought to bear on the manufacturers by an aroused public. Just recently, however, when we were confronted by a similar problem, the initiative was taken by the industrialists themselves. Here there was nothing spectacular at all—only a few scattered cases of acute liver disease, fatal in some cases, in men exposed to one of the chlorinated naphthalenes that have been used here and in Germany by hundreds of men without any apparent harm. The cases were detected by state labor officials—in itself a great advance, for such officials used to be absymally ignorant—and were taken seriously by the manufactures who called to their aid the Public Health Service, the state labor departments and experts in the field of toxicology. Only a few years ago their attitude would have been one of contemptuous refusal even to acknowledge the facts. They would certainly not have accepted any responsibility for them.

Finally this same method is being applied to that new-old industrial disease, silicosis, the dust disease which threatens men emp'oyed in work exposing them to dust containing free silica. Since Roman days it has been known that dusty work caused a wasting disease of the lungs. Pliny the Elder speaks of the "diseases of slaves," lead and mercury poisoning, and the "consumption of potters and grinders." "Grinders' rot" and "potters' rot" are ancient phrases in England. That certain dusts are more harmful than others has been known for centuries, but the study of the charactersitics of industrial dusts, which began in the middle of the last century, was sidetracked for decades by the bacteriologists, who laid all the stress on infection and ignored the part played by dust. It was not until the English began to study the dust disease of miners in the Rand that the importance of the chemical nature of dust began to be recognized. Since then an enormous amount of work has been done, especially in South Africa, England and this country, and silicosis, caused by dust containing tiny particles of free silica, is a recognized form of occupational disease.

Silicosis is at present the overwhelmingly absorbing problem of industrial hygiene, for it affects many thousands of workers, stone cutters and quarrymen, miners of metals and of anthracite, sand blasters, potters, foundrymen and makers of abrasive soaps and powders, to mention only a few of the occupations which produce silica-containing dust. This disease has created a very difficult situation for both employers and employed because it is new to both groups. The silica dust is a slow, insidious poison (though not usually classed as a poison it has a toxic action), and while the employer finds himself suddenly confronted with responsibility for a sickness he never before heard

of, the employee finds himself faced with the prospect of losing his job because of a sickness he has known about all his life but which he is willing to risk rather than lose his status as a skilled workman and sink to the level of the common laborer or of the unemployed. Obviously the way to attack silicosis to to prevent the formation and escape of dust, and it is in this direction that efforts are now being made.

History demonstrates that every advance in manufacturing process has been accompanied by new dangers to health against which protective measures must be devised if the workers are not to suffer from such advance. And these dangers are harder and harder to deal with, more complicated and less well understood than were those of 30 years ago. We may expect that this will continue to be true and that there will never come a time when the industrial physician can regard his problems as all solved.

Even if we reach a point at which all poisons and harmful dusts have been brought under control we shall still have to deal with that much more baffling and widespread industrial evil, fatigue of "mind, body and soul." Fatigue is a problem that increases in importance with the increase in mechanized industry. A typical modern factory impresses the visitor with its spacious workrooms, its good lighting and ventilation, its cleanliness, its rest rooms, its generous provision of washrooms and showers, sometimes as good as those in a country club. Some factories provide a dance hall, a baseball field or a bowling alley for their employees. And yet, if you linger long enough to get a real impression of what is going on you begin to wonder whether it would not have been better to devote all that money to one thing—to slowing up the speed of production. Once you begin to look for this the rest becomes of minor importance. Watch the workers in any mechanized operation. They cannot time their motions; the machine determines that. They cannot change, vary the routine, let up for a little, then speed up again, for they must fit accurately into the machine. There is little chance to develop skill, which might keep up the worker's interest, for the efficiency experts and the engineers have determined the most efficient way to carry on each individual process and the workman must follow the rule without deviation. He cannot take much interest in his work, it is necessarily monotonous, and when to this is added the strain of keeping up a fixed pace for hours, with no control of the speed on the part of the worker, the result is a weariness that is out of proportion to the muscular strain, because the weariness is emotional as well as physical. It is quite different from the fatigue of the craftsman or the farmer or the housewife. Their work has at once sameness and variety, enough sameness to allow of increasing skill,

Central States Society of Industrial Medicine and Surgery

Component Society of the American Association of Industrial Physicians and Surgeons

1937-38 OFFICERS

PRESIDENT ..... DR. FREDERICK W. SLOBE..2024 S. Western Ave. Chicago.
VICE-PRESIDENT ..... DR. DON DEAL.....First National Bank Bldg., Springfield, Ill.
SECRETARY-TREASURER.. DR. FRANK P. HAMMOND....6308 Cottage Grove Ave., Chicago

BOARD OF GOVERNORS

1938
DR. JAMES H. FINCH.....Champaign, Ill.
DR. F. J. OTIS.....Moline, Ill.
DR. RALPH M. CARTER.....Green Bay, Wis.

1939
DR. GEORGE L. APFELBACH....645 Fullerton Pkwy., Chicago
DR. ROBERT L. KERRIGAN.....Michigan City, Ind.
DR. WILLIAM C. GOENNE.....Davenport, Iowa

1940
DR. GEORGE W. STABEN.....Springfield, Ill.
DR. HAROLD A. VONACHEN.....Peoria, Ill.
DR. W. M. HARTMAN.....Macomb, Ill.

Chicago Society of Industrial Medicine and Surgery

1937-38 OFFICERS

PRESIDENT ..... DR. FRED G. CARLS.....5607 Roosevelt Road, Chicago.
VICE-PRESIDENT ..... DR. GENE BURROWS.....2301 S. State St., Chicago.
SECRETARY-TREASURER.. DR. FRANK P. HAMMOND....6308 Cottage Grove Ave., Chicago.

BOARD OF GOVERNORS

1938
DR. O. WALTER REST.....4157 S. Halsted St., Chicago.
DR. FREDERICK W. SLOBE....2024 S. Western Ave., Chicago.
DR. EDGAR A. DEGENHARDT....4805 Fullerton Ave., Chicago.

1939
DR. JOHN G. FROST.....718 E. 63rd St., Chicago.
DR. FELIX M. JANSEY.....30 N. Michigan Ave., Chicago.
DR. CLARENCE W. HENNAN.....841 E. 63rd St., Chicago.

1940
DR. FRED M. MILLER.....2136 Indiana Ave., Chicago.
DR. JAMES A. VALENTINE.....1608 W. 22nd St., Chicago.
DR. EMILE C. DUVAL.....105 W. Madison St., Chicago.

Repairs and Fittings of All Makes

My thirty-two years' experience in specialized manufacturing of artificial legs and arms is your guarantee of perfect workmanship and complete satisfaction. We unqualifiedly guarantee all our work as to materials and fit.
Free consultation. Proper and perfect fitting on our part assures prevention against troublesome stumps.

Male and Female Attendants

Phone CENtral 9740

RUDOLPH VERBA ARTIFICIAL LIMB CO., Inc.

Everything for the Crippled and Disabled
208 North Wells St.
Chicago

enough variety to maintain interest. No two pieces of wood or metal can be worked up in exactly the same way, no two fields can be plowed in the same way, no two batches of bread are identical, no two babies are alike in troublesomeness. In all such work a heavy effort can be followed by relaxation for a bit and as the day goes on the pace lets up. The weariness at the end of the day is an all-over muscular tiredness, leading to healthful sleep and not to the irritable fatigue of the worker who has all day long made the same motions at a speed over which he has no control.

This is the field of increasing importance to which the industrial hygienist is now turning. And in the work of Elton Mayo and Lawrence Henderson at Harvard we see a most interesting beginning of exploration into the part played by psychology in the fatigue of the man or woman employed in modern, mechanized industry.

The Employee with Heart Disease—His Management in Industry

RUFUS BAKER CRAIN, M.D.,
and
MORRIS E. MISSAL, M.D.

IN DEALING with the problem of heart disease in industry, the physician is faced with two important questions:*

1. What types of heart disease are compatible with employment in industry?

2. What can be done to conserve the usefulness of employees with heart disease and to minimize compensation costs to the employer?

In an attempt to throw light on these questions, we shall review our experience of more than seven years with heart disease in a group of employees of the Eastman Kodak Company.

The first general physical examination of the employees was made in 1914. In 1922 another physical examination was made of the 3,280 employees of three plants. Both examinations showed a considerable number of cases of organic heart disease. In 1914 the rate of incidence was not determined. In 1922 the incidence was found to be approximately 4%. In 1930 600 employees of one of the plants were examined. At that time all cardiac abnormalities, however slight, were considered in determining the rate of incidence, which was found to be 6.5%.

The employees with heart disease discovered in the 1914 examination were periodically re-examined but, owing to a limited medical personnel, not as frequently as was desirable. The survey of 1922 was followed up somewhat more systematically. Nevertheless, an employee with heart disease who had not been followed closely enough would not infrequently be found to have symptoms of beginning failure or extremely high blood pressure.

In December, 1929, we put in operation a plan which had for its purposes:

1. To establish criteria for the acceptance or rejection of applicants for employment found to have cardiovascular abnormalities.

2. To avert or postpone cardiac failure and to avoid possible attendant compensation costs, by closer supervision of such employees, by job placement, and by cooperation with family physicians.

3. To conduct a long term study of heart disease in industry.

It was decided at the outset to adopt with slight modification the criteria for the classification and diagnosis of heart disease prepared by the Heart Committee of the New York Tuberculosis and Health Association and approved by the American Heart Association.

Source of Cases

FOR the purposes of the study the following employees were chosen:

1. The employees with cardiac abnormalities discovered in the examinations of 1914, 1922 and 1930. These employees received first consideration in the present study. A number of them had been observed continuously since 1914.

2. New employees passed with compensated cardiac conditions.

3. Additional cases of heart disease discovered in the examination of (a) employees returning from sick leave, (b) employees reporting to the medical department with various complaints, and (c) special groups, e.g., executives, employees exposed to occupational hazards, and food handlers.

4. Employees with cardiac abnormalities discovered by means of roentgenograms taken at a distance of 6 feet. These roentgenograms, as a matter of routine, are taken of all applicants and, at intervals of three years or less, of all employees.

Examination of Employees

ABOUT three-fourths of the cases of organic disease reported were recorded on the standard heart charts of the New York Tuberculosis and Health Association.[1] These charts minimize the chance of omitting important data and are well adapted to statistical treatment. The examination includes a Wassermann test of the blood, complete analysis of the urine, and blood count if indicated. A teleoroentgenogram and electrocardiogram are taken in each case. The majority of the group with organic disease have had two or more electrocardiograms.

The visiting nursing service of the company, which is of a medicosocial character, is utilized to ascertain facts about the home environment of employees with cardiac conditions.

Procedure in Follow-up

ALL cases of organic heart disease and also "possible" and "potential" cases are cross-indexed and filed according to etiologic diagnosis. The intervals between examinations are usually from six months to one year. Some employees are seen every three or four months or oftener, depending on the urgency of their condition. Lack of intelligence or failure to cooperate may be factors making for greater frequency of examination.

Criteria for Employment and Placement of Persons with Cardiac Abnormalities

THE practice of discriminating according to fixed criteria in the selection and placement of employees with heart disease is a recent innovation in industry.

In a comprehensive article written in 1927, describing the attitude of certain industries in Chicago at that time toward the employment of persons with cardiac disease, Mock and Moore[2] made this statement: "Of 34 industries tabulated, only 27 have a well defined policy in connection with their employment. Nearly half of these reject all; eight will hire the well compensated case, and two others make exceptions for highly skilled workers in positions which are hard to fill."

In 1933 Davis[3] pointed out the danger and uncertainty attendant on the employment of persons with syphilitic or hypertensive and arteriosclerotic heart disease and rightly advocated intensive studies of these groups with a view to establishing criteria for their placement and management in industry.

The criteria which follow (revised as of June 1, 1934) have been used by the medical examiners for approximately five years. The suggestions of Dr. Cassius Watson, medical director of the American Telephone and Telegraph Company, were helpful in the formulation of these criteria.

---

* From the Medical Department, Eastman Kodak Company. Read before the Section on Preventive and Industrial Medicine and Public Health at the Eighty-Eighth Annual Session of the American Medical Association, Atlantic City, N. J., June 11, 1937. Published in *J.A.M.A.*, January 1, 1938.

1. Criteria for the Classification and Diagnosis of Heart Disease, ed. 3, New York, New York Tuberculosis and Health Association, 1932.

2. MOCK, H. E., and MOORE, SUSA P.: The Cardiac Patient in Industry, *J. Indust. Hyg.* 9:176-186 (May) 1927.

3. DAVIS, NATHAN SMITH, III: Cardiovascular Disease and Industry, *Indust. Med.* 2:287-289 (November) 1933; 3:317-319 (December) 1934.

TABLE I
ANALYSIS OF 278 CASES OF HEART DISEASE

	Health Record				
	Good	Fair	Poor	Total	Percentage
Etiologic Class					
Coronary artery disease	95	58	16	169	61
Rheumatic and unknown (rheumatic)	54	7	5	66	24
Hypertensive disease and essential hypertension	20	9	5	34	12
Miscellaneous	5	2	2	9	3
Total	174	76	28	278	100

	Functional Group					
Present status	I	IIa	IIa-IIb	IIb	Total	Percentage
Working	76	62	3	4	145	52
Left	35	6	0	....	41	15
Retired	20	17	3	1	41	15
Died	14	22	12	3	51	18
Total	145	107	18	8	278	100

Working period	IIa	IIa-IIb	IIb	Total
None	11	6	6	23
6 months or less	14	2	1	17
6 months-1 year	18	1	....	19
1-2 years	18	2	....	20
2-3 years	11	1	....	12
3-5 years	16	3	1	20
Over 5 years	19	3	....	22
Total	107	18	8	133

I. Reject.

A. History.

1. Syphilis (postpone rating for result of Wassermann test taken by examiner and recheck physical findings).
2. Recent hyperthyroidism.
3. Recent carditis or acute infectious diseases apt to involve the heart; rheumatic fever within three years, tonsillitis (recent or recurrent attacks).
4. Cardiac failure, recent or past.

B. Physical examination (to be made in every case regardless of history). In passing on an applicant with cardiac abnormality, the age, nervous stability, general physical condition, probability of cooperation and suitability for the job specified are to be given careful consideration. In the presence of signs or symptoms of organic heart disease—further study required — the patient must have an electrocardiogram and a 6 foot plate of the heart.

1. Signs of decompensation.
2. Foci of infection; tonsils (infected) and teeth (several carious) not removed.
3. Aortic lesions.
4. Congenital heart disease.
5. Coronary artery disease.
6. Hypertensive heart disease or essential hypertension, with persistent systolic blood pressure of 150 or more or diastolic pressure over 100, in adults up to 40 years of age after complete horizontal rest for 10 minutes.
7. Hypertension; systolic pressure of 95 or less after complete horizontal rest for 10 minutes (seldom passed).
8. Positive Wassermann reaction or other stigmas of syphilis.
9. Arrhythmias.
   (a) Auricular fibrillation.
   (b) Paroxysmal tachycardia.
   (c) Pulses alternans.

II. Accept.

A. Rheumatic heart disease (inactive) or heart disease of unknown cause. Applicants showing mitral insufficiency, stenosis or moderate hypertrophy, with good compensation and without much enlargement, with no signs of aortic lesions, are acceptable. However, each applicant should receive individual study and be classified accordingly. Applicants are accepted when there is

1. No history of recent or recurrent sore throat.
2. No history of decompensation.
3. No history of rheumatic fever within three years.

B. Hypertensive heart disease or essential hypertension (without signs of renal involvement) or with moderate cardiac enlargement and blood pressure not over the limit specified under Reject B 6.

C. Arrhythmias. Applicants with simple premature contractions or extrasystoles not associated with organic heart disease may be passed.

D. Simple tachycardia. Applicants are passed in the absence of endocrine dyscrasia or the absence of organic heart lesion. No fixed pulse rate is specified, but due regard is to be

TABLE II
CORONARY ARTERY DISEASE

A. Analysis of 169 Cases

	Functional Classification					
Present status	I	IIa	IIa-IIb	IIb	Total	Percentage
Working	39	53	2	4	98	58
Left	3	1	....	....	4	2
Retired	14	11	3	1	29	17
Died	8	18	10	2	38	23
Total	64	83	15	7	169	100
Percentage	38	49	9	4	100	

Working period	IIa	IIa-IIb	IIb	Total
None	7	4	5	16
6 months or less	12	2	1	15
6 months-1 year	12	1	....	13
1-2 years	16	2	....	18
2-3 years	8	1	....	9
3-5 years	13	3	1	17
5-10 years	12	2	....	14
Over 10 years	3	....	....	3
Total	83	15	7	105

B. Age and Length of Service

	Age, Years				
Length of Service	Less Than 49	50-59	60-69	70 and Over	Total
1- 3 years	1	....	....	....	1
4- 6 years	1	....	....	....	1
7- 9 years	1	4	2	....	7
10-15 years	4	10	14	4	32
16-19 years	6	11	8	....	25
20-24 years	5	19	14	2	40
25-29 years	1	5	7	2	15
30-34 years	....	11	9	4	24
35-39 years	....	6	8	1	15
40-44 years	....	....	2	2	4
45 years and over	....	1	2	1	4
Total	20	67	66	16	169

TABLE III

ANALYSIS OF 54 CASES OF CORONARY THROMBOSIS (51 MEN; THREE WOMEN)

Present status		Health record	
Working	33	Good	28
Left	1	Fair	17
Died	15	Poor	7
Retired	5	Unknown	2
Working period—IIa and IIb		Age, years	
None	13	Under 40	1
6 months or less	5	40-49	12
6 months-1 year	4	50-59	20
1-2 years	7	60-69	19
2-3 years	7	70 and over	1
3-5 years	9	Unknown	1
5-10 years	9		

given to the applicant's general health and nervous balance and the effect on the rate of horizontal rest for 15 minutes.

All applicants giving evidence of cardiac or circulatory disorders should have routine readings of the blood pressure, examination of the urine, a Wassermann test of the blood and a 6-foot plate of the heart at the time of the initial examination. Rejected applicants, after removal of possible foci of infection, such as carious teeth and diseased tonsils, may be reconsidered.

All persons with heart disease accepted for employment are placed in a special group and cross indexed for follow-up at regular intervals. The work assigned these employes cannot be changed without the approval of the medical department.

The medical department is furnished at the time of the examinations with a brief description or analysis of every job for which applicants are hired. The employment manager is consulted regarding any questionable adjustment and, if necessary, an inspection of the job is made by the medical examiner.

Up to the present time no person accepted for employment with adherence to the criteria outlined has shown signs of failure.

The employees under our observation are divided into two main groups —those with organic heart disease and those with possible or potential heart disease.

Organic Heart Disease: 278 Cases

ALTHOUGH we have made a diagnosis in each case under four headings, namely, etiologic, anatomic, physiologic and functional, we shall restrict ourselves for the most part to the etiologic diagnosis and the functional classification.

Our series fall into four etiologic groups:

(a) Coronary artery disease.

(b) Hypertensive heart disease and essential hypertension.

(c) Rheumatic heart disease.

(d) Miscellaneous heart disease, including syphilitic and thyroid heart disease and heart disease of unknown origin.

At this point it seems desirable to quote from the New York Heart Committee's "Criteria" the functional classification as well as the definition of potential and possible heart disease:

Functional Classification

CLASS I. Patients with organic heart disease able to carry on ordinary physical activity without discomfort.

CLASS II. Patients with organic heart disease unable to carry on ordinary physical activity without discomfort.

(a) Activity slightly limited.

(b) Activity greatly limited.

CLASS III. Patients with organic heart disease and with symptoms or signs of cardiac insufficiency at rest, unable to carry on any physical activity without discomort.

E. Possible Heart Disease

Patients who show abnormal signs or symptoms referable to the heart but in whom the diagnosis of heart disease is uncertain should be diagnosed as "Possible Heart Disease, Class E."

F. Potential Heart Disease

Patients without heart disease, whom it is advisable to follow because of the presence or history of an etiological factor which might cause heart disease, should be diagnosed as "Potential Heart Disease, Class F." In such cases the etiological factor should be stated.

To insure accuracy we obtained from the employment department the following items for the majority of employees included in this study: present status, original date of employment, duration of service, type of work and health record (lost time on account of sickness). These items appear in various combinations in the tables presented.

Table 1 gives an analysis of our group of 278 employees with organic heart disease with respect to cause of the condition, present status, health record, functional diagnosis and working period of class II *a* and III *b* employees. We have not included the working period of class II employees in this or other tables because the length of that period depends on when definite organic changes in each case began. In most instances the lesions were well established when first noted by us or our associates.

The interesting features of this summary on organic disease seem to be the large proportion of employees working without symptoms (class I),

TABLE IV

HYPERTENSIVE HEART DISEASE AND ESSENTIAL HYPERTENSION

A. Analysis of 34 Cases

Functional Classification

Present status	I	IIa	IIa-IIb	IIb	Total
Working	13	2	....	....	15
Left	4	1	....	....	5
Retired	2	4	....	....	6
Died	5	3	....	....	8
Total	24	10	0	0	34

Working period	IIa
None	4
6 months or less	1
6 months-1 year	2
1-2 years	....
2-3 years	2
3-5 years	1
Total	10

B. Age and Length of Service

	Age, Years					
Length of Service	30-39	30-49	50-59	60-69	70	Total
Under 1 year	....	....	....	....	....	....
1- 3 years	....	....	....	....	....	....
4- 6 years	....	....	1	1	....	2
7- 9 years	....	....	1	....	....	1
10-14 years	....	....	....	5	....	5
15-19 years	2	2	4	3	....	11
20-24 years	....	1	2	....	....	3
25-29 years	....	1	1	3	2	7
30-39 years	....	1	1	2	....	4
40 years and over	....	....	1	....	....	1
Total	2	5	11	14	2	34

the relatively good health record of the majority and the substantial periods of employment for those with limited capacity (class II *a* and II *b*).

Coronary Artery Disease: 169 Cases

WE AGREE with Levine[4] and others that the term "arteriosclerotic heart disease" is confusing and misleading, and we have adopted his designation "coronary artery disease" as a better name.

In Table 2 A the functional classification and the present status of each employee with coronary artery disease is shown, and also the working period of such employees in class II *a* and II *b*. Over half of this group are working, and nearly 40% of those working are in class I. The periods in which class II *a* and II *b* employees worked are of considerable length. Seven employees in the group, because of history and physical signs, were included under a double etiologic diagnosis, "coronary artery disease and rheumatic fever."

Table 2 B shows the number of persons with coronary artery disease grouped as to age and length of service. The majority of the employees in this group are over 50 and their periods of service of considerable length. Hypertension occurred in 112 cases and normal blood pressure in 57. The anginal syndrome was present in 18 cases.

In 54 of this group coronary thrombosis developed. We have analyzed this subgroup (Table 3) with respect to sex, present status, age distribution, health record and working period. All employees who have had coronary thrombosis are considered to be in class II *a*.

Sixty-three per cent, or nearly two thirds, of this group are working. The marked preponderance of men can be explained in part by the ratio of men and women employees in the Rochester plants: 76% men and 24% women (as of August 1, 1936). In this group 28 had normal blood pressure and 26 hypertension. The anginal syndrome was present in eight. It seems significant to us that in the group in whom coronary thrombosis developed, 25 of the 54 employees have worked between two and 10 years in class II *a* and II *b*!

Fifteen deaths occurred. Of these nine were due to heart disease and in six cases we have no information as to the cause.

Hypertensive Heart Disease and Essential Hypertension: 34 Cases

TO CONFORM to the definition of heart disease due to hypertension, there must be "persistent hypertension associated with enlargement of the heart." Eleven employees showed no demonstrable enlargement of the heart and were considered to be in the group with essential hypertension. We realize that exception may be taken to combining this group with the group with hypertensive heart disease. The differential diagnosis, however was so difficult and the series so small that combining the groups seemed a matter of convenience.

Table 4 A gives the present status, functional classification of the group and working period of employees in class II *a* and II *b*. Table 4 B classifies this group according to age and length of service.

Of the eight deaths in this group, four were due to heart disease, one to cerebral hemorrhage, two to malignant growth and one to accident.

Rheumatic Heart Disease and Heart Disease of Unknown (Rheumatic) Origin: 66 Cases

WE HAVE combined with 41 cases of rheumatic heart disease 25 cases in which no history of rheumatic fever, chorea or joint pains could be obtained but in which the valvular lesions were typical of rheumatic fever.

Table 5 A shows this group analyzed with respect to sex, age distribution, present status, functional classification and the working period of employees in class II *a* and II *b*. Table 5 B shows the group classified according to age and length of service.

Except in one case, there were no signs of an active rheumatic infection.

In this younger age group, in view of the more favorable prognosis of rheumatic heart disease, one would expect to see a larger proportion of employees at work than appears in our series. Of the 31 employees who left the company, only one did so because of poor health. The remainder are not working for other reasons.

Miscellaneous Heart Disease: Nine Cases

TABLE 6 gives for the employees with miscellaneous heart conditions the etiologic classification, present status, age distribution, duration of service, health record and functional classification and for those in class II *a* or II *b* the working period.

Two of the syphilitic employees had interesting records. One with a double aortic lesion and aortitis worked in class I for 22 years.

Since aortic stenosis is almost unknown in syphilitic heart disease, it is possible that a history of rheumatism also existed. Another with a large aneurysm of the ascending aorta worked in class II *b* for four years.

Of the two employees with thyroid disease, one with auricular fibrillation has worked in class II *a* for eight years. He also has a positive Wassermann reaction of the blood. The employee with paroxysmal tachycardia has definite signs of organic heart disease.

Possible Heart Disease: 187 Cases

THE group with possible heart disease includes employees showing certain "abnormal signs or symptoms referable to the heart," such as apical or basal systolic murmurs, slight hypertension and borderline abnormalities in the electrocardiogram which make further follow-up advisable (Table 7).

Protential Heart Disease: 90 Cases

FOR the employees with potential heart disease a history of rheumatic fever, chorea or joint pains or a positive Wassermann reaction was obtained. Thirty-one employees in this group were also found to have signs or symptoms suggestive of heart disease (Table 7).

Many of the employees with possible or potential cardiac abnormalities are comparatively new employees. After further observation we hope to make a complete report on this interesting group.

Management

ON THE whole, the cooperation of the employees has been excellent. The majority have been interested in the results of the examinations. We have been careful to avoid making them heart conscious and apprehensive, appreciating that it would be easy to cause a cardiac neurosis. Care has been taken to assure the employees that the examinations were not made with the object of disqualifying them for further work but rather with the object of keeping them from over-taxing their cardiac reserve.

As a rule, the medical department limits itself to giving advice on matters of hygiene. Avoidance of colds and correction of overweight are particularly stressed with this group. Except in cardiac emergencies, treatment is left entirely to the family physician. Checks are made at times on the adequacy of digitalis medication and the regularity of antisyphilitic treatment. Any deviation from accepted treatment is reported to the employee's physician. When failure is imminent, the employee is sent home and his physician notified. Copies and interpretations of routine electrocardiograms are sent to the family physician. Employees who have had heart failure are returned to work very gradually and are usually given half-day employment for several weeks.

The company provides group insurance coverage and a retirement plan, whereby an annuity is paid to men employees over 65 years of age with 20 years of service and to women employees over 60 years of age with 20 years of service.

Benefits are also provided for employees who are totally and permanently disabled. A waiting period of six months is required before disability payments are started, and in many cases sick benefit allowance carries employees during this waiting

4. LEVINE, S. A.: Clinical Heart Disease, Philadelphia, M. B. Saunders Company, Chap. 7, p. 158.

TABLE V
RHEUMATIC HEART DISEASE AND HEART DISEASE OF UNKNOWN (RHEUMATIC) ORIGIN

A. Analysis of 66 Cases (29 Men; 37 Women)
Functional Classification

Present status	I	IIa	IIa-IIb	IIb	Total
Working	23	5	1	....	29
Left	27	4	....	....	31
Retired	2	2	....	....	4
Died	....	....	1	1	2
Total	52	11	2	1	66

Working period	IIa	IIa-IIb	IIb	Total
None	....	1	1	2
6 months or less	6	....	....	1
6 months-1 year	3	....	....	3
1-2 years	2	....	....	2
2-3 years	1	....	....	1
3-5 years	1	....	....	1
Over 5 years	3	1	....	4
Total	11	2	1	14

B. Age and Length of Service

	Age, Years						
Length of Service	Under 19	20-29	30-39	40-49	50-50	60 and Over	Total
Under 1 year	1	7	3	....	....	....	11
1- 3 years	1	10	2	2	....	....	15
4- 6 years	....	3	2	....	3	....	8
7- 9 years	....	1	2	....	....	....	3
10-15 years	....	2	6	4	1	....	13
16-19 years	....	....	2	4	3	2	11
20-24 years	....	....	....	1	....	....	1
25-29 years	....	....	....	2	....	....	2
30-34 years	....	....	....	....	1	....	1
35-39 years	....	....	....	....	....	1	1
Total	2	23	17	13	8	3	66

period. This retirement annuity and disability benefit plan makes it easier to deal with employees with heart disease who are progressing unfavorably.

Medicolegal Aspects

THERE has been but one sudden death at work in our series over a period of seven years. The employee involved was an executive who had coronary artery disease with marked hypertension. He probably died of coronary thrombosis. No autopsy was performed.

We do not know of any case in our series in which an accident aggravated existing heart disease. This is an experience similar to that which Clark[5] reported. We have tried to follow his practice of placing employees with heart disease, especially elderly ones, where no accident hazard exists.

It is interesting to note that Masters[6] in a recent article discussed the role of effort, trauma and other factors in the precipitation of coronary artery thrombosis. His conclusion, which we feel is important, is quoted in part:

Coronary artery thrombosis develops irrespective of the form of activity whether it be strenuous, moderate, or slight effort or rest. Neither does excitement, climbing a hill against the wind, cold weather or eating exert an influence. All these factors, however, play a material part in the production of an attack of angina pectoris, and the confusion resulting from failure to make a differential diagnosis between an anginal syndrome and coronary thrombosis has led to the more or less prevalent idea that strenuous labor contributes to the formation of coronary thrombosis. Coronary thrombosis and the anginal syndrome are both the result of coronary artery disease, but aside from that have nothing in common.

It has been our policy when the anginal syndrome is present to curtail the employee's activities or, if necessary, advise a period of complete rest.

In a few employees, thrombosis occurred while they were at work. Nevertheless, in no case were we of the opinion that the work was the precipitating factor. It is of interest that, of 52 employees with coronary thrombosis, 21 were clerical or executive workers and 15 were engaged in light factory work, eight in medium factory work and eight in heavy factory work. The 52 cases occurred among the 169 employees found to have coronary artery disease, whose work was as follows: clerical or executive work 56, light factory work 53, medium factory work 40 and heavy factory work 20.

In view of the precautions taken to prevent undue exertion when coronary artery disease was known to be present, wo do not feel that our experience justifies a broad assertion that exertion cannot be the precipitating factor.

Summary and Conclusions

THE use of an etiologic, anatomic, physiologic and functional diagnosis has been found valuable in the selective employment and management of persons with heart disease.

Employees whose cardiac reserve was limited (class II a and II b) have been continued in employment for relatively long periods. We feel that proper placement and careful supervision have contributed to this result.

We believe that benefits accrue from recognizing many cases of heart disease which would otherwise be neglected until much further advanced. Opportunity is afforded to study heart disease in the preclinical stage (possible and potential heart disease).

Abstract of Discussion

DR. ERNST P. BOAS, New York: The subject discussed by Drs. Crain and Missal concerns itself with the problem: Can the patient with heart disease work and, if so, what kind of work can he do? This is as important as medical treatment. Far too often the physician insists on the patient's retirement. The heart lesion becomes so magnified in the eyes of the physician and the patient that

TABLE VI
MISCELLANEOUS HEART DISEASE

Etiologic Classification	Present Status	Age Group	Functional Classification	Duration of Service Years	Health Record	Working Period if IIa-IIb
Syphilitic	Died	50-59	IIa-IIb	7- 9	Good	3 months
Syphilitic	Retired	69-69	I	30-35	Poor	
Syphilitic	Died	60-69	IIa-IIb	40-44	Fair	2½ years
Syphilitic	Died	50-59	IIb	16-19	Good	4 years
Thyroid	Working	50-59	IIa	25-29	Good	8 years
Thyroid	Working	60-69	IIa	20-24	Good	8 years
Unknown (emphysema)	Left	40-49	I	16-19	Fair	
Unknown (paroxysmal tachycardia)	Retired	40-49	I	30-34	Poor	
Unknown (rheumatic or congenital)	Working	20-29	I	7- 9	Good	

5. CLARK, W. IRVING: Effects of Accidents on Cardiac Employees, *Am. Heart J.* 3:539 (June) 1928.
6. MASTERS, ARTHUR M.: Coronary Artery Thrombosis, *Indust. Med.* 6:307 (May) 1937.

TABLE VII
POSSIBLE AND POTENTIAL HEART DISEASE

	Men	Women	Total
Possible heart disease			
Total	130	57	187
Working	98	33	131
Not working	32	24	56
Potential heart disease			
Working	42	19	61
Syphilitic	17	8	25
Rheumatic	25	11	36
Not working	13	16	29
Syphilitic	4	1	5
Rheumatic	9	15	24
Total	55	35	90
Syphilitic	21	9	30
Rheumatic	34	26	60

the patient lives just for his heart. As Drs. Crain and Missal have shown, such enforced invalidism is often quite unnecessary. It takes courage for the physician to keep a cardiac patient at work for, if things go wrong, the physician will be blamed. The authors' observations, carried on over many years, demonstrate that patients with serious heart ailments can continue in industry without harm to themselves. Yet it is almost the rule to tell a patient who has had a coronary thrombosis that he is finished and must retire. I see many men with valvular disease and coronary artery disease and coronary thrombosis, the majority of whom return to work in factories or as painters and carpenters from economic necessity. Most of them get along fairly well. It is rare in my experience for the work as such to bring about death or even to hasten the evolution of the cardiac ailment. Patients with angina pectoris who have to travel long distances to and from work complain more of distress in traveling than they do of any distress while at work. Severe physical strain may aggravate a cardiac condition, although there are some who believe that it cannot precipitate a coronary thrombosis. I disagree with that. I recall instances in which a physician ran up four flights of stairs and when he reached the top had a sudden agonizing pain and showed classic symptoms of coronary thrombosis, and of working men who, following unusual, unexpected strain had immediate symptoms of coronary thrombosis. In a similar manner, heart failure or an attack of auricular fibrillation may be induced. A heart condition is compensable only if pain, dyspnea and incapacity follow immediately on some accident in industry. Drs. Crain and Missal have shown that these patients at work must be under medical supervision. Even if no sudden, acute insult precipitates a dramatic progress of the heart lesion, continuous, insidious overstrain will undoubtedly shorten the life of the cardiac patient. Knowledge of the effects of different kinds of work on the status of a cardiac patient is still very sketchy. The authors have made a real approach to establishing some fundamental facts in this regard. Their study demonstrates the tremendous value of a continuous study of a large group of workers in industry over a long period of time.

DR. W. D. STROUD, Philadelphia: Two years ago I presented this subject before this section, suggesting that a great many more cardiac patients were employable than were being employed. Forty thousand workers were directly observed in the performance of 1,000 operations in 25 industries. It was concluded that, in normal times, of the 200,000 odd jobs in manual work in Philadelphia industries 25%, or 50,000, could be performed by persons having heart disease without compromising either the job or the job holder. This fact, I believe, is not fully understood by the average employer, and, as Drs. Crain and Missal's paper shows, between six and seven of every hundred employees in the average plant, if carefully examined, would lose their jobs on account of cardiovascular defects, if the employer wished to be absolutely safe from the standpoint of the compensation laws, in which the family of a worker receives compensation should death occur as a result of his work. Also, on examining men for employment, a large group would be refused employment because of cardiovascular abnormalities. Here are men wishing to work who are unnecessarily refused jobs. This seems tragic to those of us who during the past few years have observed so many preferring relief to actual jobs. Too often a physician finds a murmur or a mild hypertension or even early symptoms of coronary disease and tells that man he must give up his position and then does not assume the proper responsibility in helping such a person secure other employment. As Drs. Crain and Missal have shown, such persons may be kept in their jobs if there is a proper understanding between the employer, the employee and the plant physician. This entire subject is a matter of educating the public, the employer and the general practitioner. This education and placement in industry can be accomplished by local heart and tuberculosis organizations. It is their job, through trained placement workers, to persuade employers that class I and class II a patients are employable and are usually more conscientious in their work than those without such handicaps. I am glad to see that Drs. Crain and Missal at Rochester regularly permit the employment of persons with mild hypertension. Too many persons have been made invalids for the rest of their lives through the discovery of questionable hypertension.

DR. R. B. CRAIN, Rochester, N. Y.: Dr. Boas spoke of the medicolegal aspects. There wasn't time to go into that. We had in our series but one sudden death occurring at work and that was probably due to a coronary thrombosis. There has been, to my knowledge, no aggravation of existing heart disease in employees at work. Dr. Stroud voiced his approval of the employment of the patient with mild hypertensive disease. We decided to follow such a policy only after surveying the records of a considerable number of hypertensive persons already at work and finding that many of them had worked for periods of from 10 to 15 years without symptoms.

Deaths Following Elixir of Sulfanilamide-Massengill

NINE out of 10 patients who had been given a proprietary elixir of sulfanilamide died recently in Tulsa, Okla., from anuria which apparently resulted directly from poisoning by this elixir.[1] As we go to press, the record is swelled by the report of four additional deaths with another likely fatality in East St. Louis.* The product was prepared and sold by the S. E. Massengill Company of Bristol, Tenn. From tests by the chemical laboratory of the American Medical Association, this elixir appears to be a solution of approximately 40 grains of sulfanilamide to a fluidounce of a menstruum containing about 72% of diethylene glycol (by volume) with flavoring. Apparently it is not known whether the toxicity of sulfanilamide is enhanced by the presence of diethylene glycol—or vice versa. The solvent, diethylene glycol, is itself not an indifferent substance. While its use is not permitted in food products because of the absence of any scientific evidence establishing beyond doubt its harmlessness when taken internally, it has long been utilized as a solvent in various industrial processes. The dosage of the elixir administered unquestionably contained a large amount of this sub-

1. In the preparation of this editorial *The Journal* has been aided by information received through Drs. James Stevenson, president of the Tulsa County Medical Society; Homer A. Ruprecht of the Springer Clinic, Tulsa; Darwin B. Childs of the Childs Clinic, Tulsa, and I. A. Nelson of the Springer Clinic, Tulsa. Officials of the Massengill Company have sent a confidential statement of the composition of the product.

* Current Comment; *J.A.M.A.*, October 23, 1937.

stance. It would appear to be clear that the diethylene glycol or the diethylene glycol-sulfanilamide combination rather than the sulfanilamide was responsible; one of the patients had received tablets over a period of two weeks without any bad effects and then showed the typical train of symptoms after taking the elixir.

From 24 to 48 hours after the administration of the substance, nausea, vomiting, malaise and sometimes diarrhea developed; then complete anuria appeared within two to five days. The nonprotein nitrogen, urea nitrogen and creatinine rose rapidly.

In the postmortem examination there was usually an accumulation of fluid in the serous cavities, with degeneration of the tubules of the kidney and a peripheral necrosis of the liver.

The laboratory of the American Medical Association is conducting careful chemical and pharmacologic experiments to indicate the toxic factors of the elixir concerned. Possibly other factors may be involved such as the decomposition of the sulfanilamide in the presence of the aqueous diethylene glycol solution.[2] Possibly there may have been some error in the process of manufacture. Indeed the possibilities are unlimited, since we are here concerned with a preparation not standardized by any reliable agency, semisecret in composition and apparently hastily rushed into the market to meet an over-enthusiastic reception of a new remedy.

This tragic experience should be a final warning to physicians relative to the prescribing and administration of semisecret, unstandardized preparations. It would indeed be a pity if this tragedy were to be repeated again and again as more and more new remedies are put forth.

The Journal and the Council on Pharmacy and Chemistry of the American Medical Association have been alert in their attempts to inform the medical profession as to the status of sulfanilamide. The Council on Pharmacy and Chemistry has not accepted any stock solution of this substance. It has accepted a sufficient number of preparations developed by manufacturers to supply the needs of the medical profession for this substance in the present state of our knowledge. Acceptance by the Council indicates that the products have been examined and that there is sufficient clinical evidence relating to their use to indicate at least their safety when prescribed in the designated manner.

A physician is not compelled to follow the United States Pharmacopeia, the National Formulary or the Council on Pharmacy and Chemistry in the prescribing of drugs. He may, if he wishes, prescribe anything that he thinks may be of benefit for his patient. Indeed, the Council on Pharmacy and Chemistry encourages scientific experimentation with new remedies, provided these experiments are carried out with suitable controls and with adequate facilities for therapeutic investigation. In the usual conditions of practice, however, it is far safer—as this tragedy again emphasizes—to limit prescriptions of nonofficial products to those accepted by the Council on Pharmacy and Chemistry and to use them as described in New and Nonofficial Remedies.

2. The Chemical Laboratory found no evidence of decomposition of sulfanilamide in the specimen of elixir examined.

The "Elixir" of Sulfanilamide Episode

PHYSICIANS have realized for some time that the existing Food and Drugs Act does not sufficiently protect the public.* Proprietaries of unknown formula are allowed to be sold directly to the public, a procedure not allowed in certain foreign countries. Opposition, however, on the part of proprietary manufacturers has been so strong that remedial legislation has been obstructed. Doubless a certain amount of prescribing of proprietaries of unknown composition takes place although this is a drop in the bucket compared to the counter sale of these remedies. Occasionally new drugs like dinitrophenol, cinchophen and amidopyrine are offered to the profession before their dangerous qualities are realized. Rarely, fortunately, is a distinctly poisonous drug offered for general distribution.

The tragedy of 73 known and 20 more presumptive deaths from the dispensing of Elixir of Sulfanilamide-Massengill, serves to call attention to the inadequacy of the present laws governing the sale of drugs. The so-called elixir was not an elixir in that it contained no alcohol. Further, the elixir contained an undeclared solvent — diethylene glycol — which proved to be the fatal poison. It seems, too, that the poisonous quality of diethylene glycol should have been known to the manufacturing chemist. And finally, although this was a new preparation, no preliminary tests as to its poisonous nature were made before it was sold to the drug trade.

We are told the only law violated was the use of the term "elixir" for a preparation which was not an elixir. Had the law required the revelation of the presence of the relatively unknown diethylene glycol as a solvent it is problematic how many of those physicians who prescribed the preparation would have been deterred, so great is the faith of most physicians in the pharmaceutical houses. While these concerns are jealous of their reputations and as a rule are careful not to introduce drugs harmful in the recommended dosage, there is no law requiring such precaution.

Corrective legislation has been presented to Congress by Senator Copeland embodying the recommendations of the Secretary of Agriculture, who investigated the tragedy.

This proposed legislation will be lacking if it does not include the prohibition of direct sale to the public not only of distinctly dangerous drugs which should be limited to dispensation by prescription, but also of drugs which are habit-forming, including the barbiturates, the continued use of which in certain cases results in mental changes. The proposed changes, along with heavier penalties for infringement, will add protection to the public but too much emphasis cannot be placed on the importance of each physician's prescribing only those remedies about which he is informed.

* Editorial, *Minnesota Medicine*, January, 1938.

Golden Silence?

FOR centuries physicians have buried themselves under a blanket of silence.* Engrossed in the scientific and professional aspects of medicine, they have calmly carried on their practices, taking the attitude that the public need not be informed, that the physician's good works would speak for themselves. As a result a vast amount of misinformation has sprung up regarding the medical profession.

The world at large distrusts and misunderstands our code of ethics, they overestimate our income, they consider our scientific societies as being essentially labor unions built up for our selfish gain, they even misinterpret our motives in the daily conduct of our practice. Such a situation is not conductive to that wholesome respect and mutual confidence which is so essential to the medical well being of this country. All successful businesses have come to realize that public good will is essential. Medicine will find it no less necessary. The fact that the advocates of reform are vocal does not help matters.

The remedy, of course, lies in an awakening of the medical profession. Starting with a rededication of ourselves to the ideals of service traditional with medicine, every physician should make an earnest effort in his own practice to stimulate public good will. This can be done, and is an effective barrier against proposals for change. It is not enough, however. Every member of the medical profession should and must become more familiar with the economic and social problems of the day. Having this information he should use every opportunity to point out to the American public those principles upon which a sound plan for medical care should be established. An old axiom says, "Silence is Golden," but silence is wrong when it permits the unnecessary destruction of a superior medical system proved by centuries of trial.

* Editorial in *The Medical Bulletin*, Sedgwick County Medical Society, Wichita, Kansas, January, 1938.